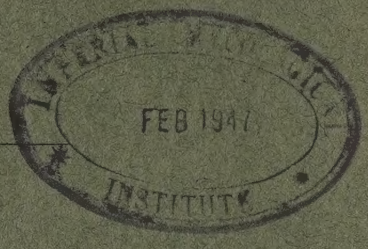
1946.

QUEENSLAND



FORTY-~~FIFTH~~ SIXTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

REPORT OF THE DIRECTOR

TO

THE HON. THE SECRETARY FOR AGRICULTURE AND STOCK

(*As required by "The Sugar Experiment Stations Acts, 1900 to 1941"*).

PRESENTED TO PARLIAMENT BY COMMAND.

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FORTY-SIXTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to present the Forty-sixth Annual Report of the Bureau of Sugar Experiment Stations, covering the period from 1st July, 1945, to 30th June, 1946. Submission has again been delayed by the lack of final sugar returns brought about by shipping difficulties; unfortunately, final data are still unavailable for five mills, and consequently some of the production statistics herein contained are close approximations rather than definitive figures.

ARTHUR F. BELL, Director.

Brisbane, 21st October, 1946.

Director's Report.

General.

The period under review saw the final collapse of the Japanese war machine, and the cessation of hostilities in the Pacific. In the intervening months a large proportion of the members of the armed forces have returned to civilian life and many wartime controls, including that of manpower direction, have been abolished. However, as must be expected, the effects of the years of disruption are still apparent and industrial life has not yet returned to normalty; indeed, in some respects, the supply position has been more difficult than in wartime.

Crushing in the 1946 season has once more commenced with a shortage of canecutters, while inadequate shipping, and transport difficulties generally, delayed the despatch of 1945 sugar; clearances are not yet complete. Macknade mill (Ingham) started crushing on 29th May, followed by Hambledon, Mulgrave, Goondi, South Johnstone, and Mourilyan on 13th June; with the exception of Invicta, all mills north of Bowen were crushing by the end of June. All these mills commenced with a shortage of cane cutters, and half of them were able to work only two shifts. Moreover, in the first two weeks of crushing, there was a considerable defection of inexperienced cutters who found the work too arduous. It is apparent that reduced crushing rates will operate generally throughout the season.

The winter of 1945 was mild, with fair rainfall, and young plant cane and ratoons for the 1946 harvest had a reasonably good start. Spring and early summer conditions were somewhat dry, especially in southern districts, but general prospects at the beginning of the year were satisfactory. The wet season broke early, and excessive rains were experienced in northern and central districts between January and the first week in March, giving rise to extensive flooding; two cyclones were also recorded. Damage to farms, crops, and buildings

was severe in the Burdekin delta, but elsewhere, with individual exceptions, damage was much less serious than was expected. Monsoonal rains ceased abruptly early in March and thereafter conditions remained abnormally dry, especially in the south, where a drought of the first magnitude has been experienced. In northern canefields the droughty conditions have accentuated grub damage to standing crops, while in central and southern districts frequent and severe frosts have wrought havoc in stunted crops.

The subjoined table sets out monthly, total, and average rainfall, together with the number of wet days, recorded in the chief centres of sugar production during the period 1st July, 1945—30th June, 1946.

TABLE I.—RAINFALL IN CHIEF CENTRES OF CANE PRODUCTION, JULY, 1945—JUNE, 1946. REGISTRATIONS ARE RECORDED IN INCHES AND HUNDREDTHS OF AN INCH.

Centre.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	Total for 1945–6.	Average Annual Total.	No. of Wet Days.
Mossman	1·94	0·32	0·46	3·58	2·09	10·09	19·40	22·04	4·91	0·88	3·32	0·85	69·88	92·76	157
Cairns	3·03	0·37	0·19	0·68	3·39	12·31	12·81	20·61	3·19	0·63	4·28	0·74	62·23	88·75	132
Babinda	7·70	1·10	2·39	6·13	3·84	12·96	27·04	40·13	22·37	3·05	9·03	1·22	136·96	166·17	139
Innisfail	6·91	1·24	2·15	5·30	2·72	5·90	30·04	33·34	20·17	2·64	6·62	1·35	118·38	143·78	151
Tully	11·83	3·23	3·65	4·53	6·43	9·66	41·00	55·10	22·81	8·53	12·71	1·43	180·91	180·71	142
Ingham	1·49	0·67	0·66	2·82	1·69	4·15	26·59	18·16	20·17	0·27	2·97	0·09	79·73	79·92	126
Giru	0·81	0·00	0·14	1·42	0·48	2·06	25·32	14·77	26·94	0·00	0·00	0·00	71·94	45·96	50
Ayr	2·22	0·09	0·21	2·01	0·32	2·33	11·00	11·99	13·15	0·10	0·12	0·00	43·54	41·54	76
Proserpine	4·30	0·78	1·17	3·39	1·14	2·41	29·12	9·71	16·73	0·33	1·61	0·00	70·69	71·51	106
Mackay	4·68	0·09	1·31	5·10	1·63	2·00	15·60	3·36	19·18	0·53	2·92	0·07	56·47	66·91	91
Sarina	4·17	0·34	1·76	6·52	1·78	3·24	22·20	5·82	18·89	0·46	1·08	0·11	66·37	69·81	103
Bundaberg	4·58	0·00	3·26	1·99	0·70	1·12	4·91	1·30	4·82	2·73	0·54	0·00	25·95	43·47	68
Childers	3·16	0·03	2·58	3·03	0·94	1·48	8·43	2·25	3·80	1·46	0·61	0·07	27·84	41·78	96
Maryborough	4·38	0·43	3·14	2·04	1·05	3·12	5·70	2·24	7·30	2·50	1·02	0·18	33·10	45·63	95
Nambour	4·81	0·22	2·84	3·89	4·16	8·04	9·30	8·36	22·11	6·92	1·11	0·16	71·92	64·16	110
Beenleigh	3·24	1·08	2·85	2·06	6·41	4·89	7·11	5·28	11·31	5·88	0·14	0·14	50·39	47·49	95

Estimate of the 1946 Crop.

The usual preliminary estimate, issued in May, indicated that some 4,400,000 tons of cane would be available for crushing, and it was computed that there would be manufactured therefrom 625,000 tons of 94 net titre sugar, or approximately 605,000 tons of bagged raw sugar. The area available for harvest was estimated at 246,000 acres.

Continued dry weather and heavy incidence of frosts soon made it evident that these tonnages would not be attained and a re-estimate at the end of June forecast a maximum crushing of 3,927,000 tons of cane. By this time it was also apparent that the ratio "tons of cane to one ton of sugar" would be relatively high and expectation of sugar was reduced from 625,000 tons to 550,000 tons. The quality of cane was still deteriorating as a result of drought, frost, and grub damage, and it was obvious that a continuance of unfavourable weather conditions must result in still further crop reductions.*

Prior to the termination of the war, when production goals were still promulgated, the target for Australian production for 1946 had been set at 725,000 tons of bagged sugar. This meant, in terms of 94 net titre sugar, that Queensland's target was about 710,000 tons. Output will therefore be about 200,000 tons short of planned production.

Below (Table II) will be found details of mill and district estimates of the 1946 crop, made in April-May, and again in June-July, together with the recorded crushings of the previous season. It will be seen that northern district estimates (particularly those of June-July) are materially below 1945 crushing. The irrigated area of the Lower Burdekin, in spite of flood and cyclone damage, has shown little variation, while Mackay district estimates indicate a probable increase of 20 per cent. The June-July estimate of the southern district crops was little more than 50 per cent. of the 1945 crushing, and the crop was still visibly deteriorating.

* The final estimate of the 1946 crop subsequently placed production at 515,000 tons.

TABLE II.—SUGAR CANE CROP, HARVESTED, 1945—ESTIMATED, 1946 (TONS).

1945 Crop.		Mill.	1946 Estimates.	
Domestic Crushing.	Actual Crushing.		April–May.	June–July.
118,752	118,752	Mossman	102,000	102,000
149,876	149,876	Hambledon	147,500	120,000
221,020	221,020	Mulgrave	166,100	140,000
179,845	179,845	Babinda	169,000	169,000
158,173	158,173	Goondi	135,000	135,000
213,861	213,861	South Johnstone	175,000	160,000
137,836	137,836	Mourilyan	120,000	116,000
207,891	207,891	Tully	190,000	185,000
284,846	284,846	Victoria	240,000	230,000
271,513	271,513	Macknade	270,000	260,000
1,943,613	1,943,613	District Totals	1,714,600	1,617,000
93,170	93,170	Invicta	98,000	98,000
178,892	178,892	Pioneer	176,630	176,000
201,715	201,715	Kalamia	194,000	185,000
211,606	211,606	Inkerman	204,500	204,000
685,383	685,383	District Totals	673,130	663,000
147,982	147,982	Proserpine	150,000	100,000
171,083	172,468	Farleigh	190,000	190,000
121,025	120,105	Racecourse	215,000	216,000
152,686	152,654	Pleystowe	184,859	180,000
147,341	147,128	Marian	175,000	175,000
80,362	80,412	Cattle Creek	75,000	75,000
64,480	64,305	North Eton	102,000	80,000
129,461	129,366	Plane Creek	170,000	170,000
1,014,420	1,014,420	District Totals	1,261,859	1,186,000
177,952	177,952	Bingera	140,000	95,000
141,889	156,987	Fairymead	136,000	85,000
137,397	137,397	Millaquin	100,000	70,000
52,956	52,956	Qunaba	30,000	
40,153	40,153	Gin Gin	38,730	15,000
150,146	162,328	Isis	110,000	45,000
58,373	30,454	Maryborough	47,140	41,000
34,883	35,522	Mount Bauple	30,000	15,000
96,391	96,391	Moreton	100,000	80,000
18,048	18,426	Rocky Point	17,000	15,000
378	..	Eagleby	Ceased	operation
908,566	908,566	District Totals	748,870	461,000
4,551,982	4,551,982	State Totals	4,398,459	3,927,000

1945 Crop Statistics.

The 1945 season was prolonged by reduced crushing rates and crushing was not completed until 7th January, 1946, when Macknade and Farleigh mills ceased operations.

Some residual railway transport difficulties required the diversion of a small quantity of cane, while the destruction of part of the Maryborough mill by fire, halfway through the season, necessitated the diversion of the remainder of the crop to other mills. In consequence, it has again been necessary to distinguish between the actual and "domestic" crushings of mills (see Table II). The domestic crushing of each mill represents the quantity of cane harvested from land assigned to that particular mill, although a proportion may have been crushed at other mills. The actual crushing represents cane which passed through each mill's rollers, irrespective of ownership.

Although, naturally, all mills make a very close approximation of the quantity of sugar manufactured, final official figures are not available until this sugar has been delivered to the Sugar Board and analysed. Owing to sea transport difficulties the lifting of 1945 season sugar is not yet complete and hence it is possible to give only close approximations for 1945 crop data in Tables III, IV, and V.

The 1945 cane crop of 4,551,982 tons yielded 644,589* tons of 94 net titre sugar, or 9,589 tons in excess of the preliminary estimate made in May, 1945. On the general basis of an improved machinery, material and fertilizer position, it had been expected that 1945 would continue the upward trend started in 1944, but drought conditions in the Mackay area were responsible for a reduced production of perhaps 50,000 tons. The ratio "tons of cane per ton of sugar" will be very close to 7·06, which is nearly 0·2 higher than the average for the last ten years and 0·23 higher than in 1944.

* Subject to final minor correction.

The following table (Table III.) records the distribution of production between the mill areas lying north of Townsville (10), and those lying south thereof (22) over the period 1941-45:—

TABLE III.—SUGAR PRODUCTION, 1941–45.

District.	1941.	1942.	1943.	1944.	1945.
	Tons.	Tons.	Tons.	Tons.	Tons.
North of Townsville	305,819	263,908	206,634	259,573	281,998
South of Townsville	391,526	341,772	279,813	383,967	362,591
Total	697,345	605,680	486,447	643,540	644,589

The area of cane harvested for delivery to the mills was 239,826 acres, an increase of 17,611 acres—or almost eight per cent.—over 1944 figures. An aggregate area of 13,298 acres was also recorded by the mills as having been cut for the supply of plants. The area harvested for milling was devoted to plant, ratoon and standover cane in the following proportions—

	Per cent.
Plant cane	44·5
Ratoon cane	51·0
Standover cane	4·5

The yield per acre harvested for crushing purposes was 19 tons of cane, and 2·7 tons of sugar, compared with 19·8 tons and 2·9 tons respectively for 1944. The 1945 season is the sixth consecutive year in which tons of cane per acre has been below 20, and tons of sugar per acre below 3.

Tonnages of cane crushed, and average yields of cane and sugar per acre in the several districts are set out in Table IV.—

TABLE IV.—TOTAL AND AVERAGE YIELDS BY DISTRICTS, 1945 (DOMESTIC CRUSHING).

District.	Tons Cane Crushed.	Tons Cane per Acre.	Tons 94 n.t. Sugar per Acre.
Mossman–Ingham	1,943,613	20·44	2·97
Lower Burdekin	685,383	27·85	4·37
Proserpine	147,982	14·79	2·20
Mackay	866,438	13·72	1·79
Bundaberg–Gin Gin	565,445	18·83	2·45
Childers–Maryborough	228,304	19·14	2·62
Nambour–Beenleigh	114,817	22·68	2·94
State Total and Averages	4,551,982	18·98	2·69

Production data recorded for the State over the ten-year period 1936-1945 are set out in Table V. The sharp downward trend which commenced in 1940 had been arrested in 1944 but, owing mainly to drought conditions in the Central districts, there was no further increase in 1945, while current estimates indicate that the ground gained in 1944 will be lost in 1946.

TABLE V.—ACRES CULTIVATED AND HARVESTED, YIELDS OF CANE AND SUGAR, ACRE YIELDS, AND QUALITY OF CANE, 1936–1945.

Year.	Acres Cultivated. *	Acres Harvested for Milling.	Total Yields.		Yields per Acre.		Tons Cane to One Ton Sugar.
			Cane.	Sugar.	Cane.	Sugar.	
			Tons.	Tons.	Tons.	Tons.	Tons.
1936	338,686	245,152	5,171,516	744,261	21·10	3·04	6·94
1937	348,840	249,683	5,132,934	763,325	20·56	3·06	6·73
1938	347,199	251,064	5,342,085	778,136	21·28	3·10	6·87
1939	353,996	261,047	6,038,821	891,422	23·14	3·41	6·77
1940	350,851	265,738	5,180,756	759,446	19·50	2·86	6·82
1941	334,787	246,939	4,793,589	697,345	19·41	2·82	6·87
1942	316,798	238,213	4,350,642	605,680	18·26	2·54	7·18
1943	326,478	228,895	3,397,424	486,747	14·84	2·125	6·98
1944	317,386	222,215	4,398,190	643,540	19·79	2·90	6·83
1945	326,567	239,826	4,551,982	644,589	18·98	2·69	7·06
True Average for 10 Years	336,159	244,877	4,835,794	701,419	19·75	2·86	6·89

* Data supplied by Government Statistician; figures for 1945 provisional.

As might be expected, molasses production was substantially the same as in the 1944 season. Utilization of this molasses (see Table VI) was also substantially the same as in the preceding season; the quantity used as fuel decreased by some half million gallons, while somewhat greater quantities were used as fertilizer and sold to distilleries.

TABLE VI.—DETAILS OF DISPOSAL OF MOLASSES FOR THE TEN-YEAR PERIOD, 1936–1945. DATA SUPPLIED BY THE GOVERNMENT STATISTICIAN.

Method of Usage.	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Distilleries	6,086,864	7,071,109	8,275,887	9,581,241	11,531,396	12,882,397	10,457,747	7,345,596	9,136,862	9,380,679
Fertilizer	3,211,423	3,363,624	3,293,543	4,295,289	3,334,372	1,510,650	1,857,300	2,122,220	2,745,617	3,074,755
Stock Feed	4,351,822	3,914,113	4,237,196	4,727,170	5,380,242	3,490,937	3,071,918	3,055,728	4,719,517	4,675,909
Mill Fuel	6,354,841	5,576,764	3,748,590	3,834,653	1,781,425	1,232,338	3,024,370	2,176,926	2,251,737	1,748,299
Other Purposes ..	397,080	157,496	232,049	188,889	228,450	158,821	303,240	441,522	254,358	423,085
To Waste	560,326	466,481	498,926	457,541	47,069	55,237	31,153	97,643	16,660	50,902
Total ..	20,962,356	20,549,587	20,286,191	23,084,783	22,302,954	19,330,380	18,745,728	15,239,635	19,124,751	19,353,629

Sugar Values, 1945 Season.

The total value of the 1945 sugar production has been computed by the Sugar Board to be slightly in excess of £13,000,000. The average value of No. 1 Pool sugar has been declared at £20 8s. 2d. per ton, and No. 2 Pool sugar at £16 17s. 9d. per ton. Since the total production of sugar was well within the limits of the 1939 "peak" of 737,000 tons, the great bulk of the sugar produced was sold in No. 1 Pool. However, six mills (Macknade, Victoria, Pioneer, Kalamia, Inkerman and Bingera) produced from cane grown on assigned land an aggregate of 19,257 tons of sugar in excess of peak quotas, and this sugar was placed in No. 2 Pool and sold at export rates. Ten tons of sugar was produced from cane grown on unassigned land and hence is classed as "excess" sugar. The average price obtained for all sugar was approximately £20 6s. 1d. per ton.

The proportion of No. 1 Pool sugar deemed to be required for consumption and use within the Commonwealth has been determined as 70·23 per cent. and the price payable for this sugar was £21 18s. 10d. per ton. The value of No. 1 Pool sugar (£20 8s. 2d. per ton) is the weighted average of home consumption and export prices for sugar produced within mills' peak allotments.

Review of the Industry.

A cataclysm of the magnitude of a world war inevitably has far-reaching and long-enduring effects on industry. One of the effects of the 1914-1918 war was a complete rebuilding of the structure of the Queensland sugar industry; the effects of the last war have yet to be fully developed but it is apparent that they will also be of great importance.

The immediate effect has been a fairly serious undermining of the virility of the industry: The cumulative effect of acute shortages of labour, machinery, equipment, materials and particularly fertilizers has impaired production and manufacturing potentialities and depreciated the fertility levels of soils to a point from which it will take some years to recover. At the same time it is evident that the necessities of war have fostered marked advances in technical processes generally, while the world-wide shortage of labour has stimulated the development of mechanical harvesting and loading and other labour-saving practices. The extent to which these are adopted will profoundly affect the economics of cane sugar production.

One result of fertilizer shortage has been to stimulate interest in, and appreciation of, the intense value of correct fertilizer usage. At the same time there have been spectacular advances in the development of new chemical pesticides, fungicides, and weedicides. All these factors must soon beneficially influence production per unit area.

The improved level in production of sugar in Queensland, noted from the 1944 season in last year's report, was barely maintained in the 1945 season. The quantity of cane crushed was greater than in 1944 by some 150,000 tons but, due to an abnormally low average C.C.S. value (14·41 per cent.) the quantity of sugar produced was only a thousand tons in excess of 1944 production.

Conditions in respect of fertilizer, labour, equipment and availability of railway transport showed further improvement but still fell considerably short of pre-war standards. Only three mills were reported to have crushed the entire season at two shifts (six in 1944), though

several others operated at two shifts for periods. Although there were no legal restrictions on crushing rates, the average weekly rate (arithmetic mean) was only 76·7 per cent. of the average normal rate determined by the Royal Commission of 1942-43. This however was an improvement over the 1944 average (74·1 per cent.). For individual mills the rate varied from 46·6 per cent. to 112·2 per cent.

One important phase of the industry, in which there was no improvement, was the lifting of the raw sugar at the ports, with the result that many mills had large quantities of 1945 sugar in storage well into the 1946 season.

The average performance of the factories showed a definite decline in standard in spite of a slight increase in reduced extraction, as is indicated in the following table. For comparison pre-war values are also given—

—	1945.	1944.	Approximate Average 1937–1940.
Overall Recovery	84·69	86·11	87·5
Overall Recovery E.S.G.	84·39	85·81	87·1
Boiling House Efficiency	93·04	94·20	96·3
Boiling House Efficiency E.S.G.	92·71	93·91	95·9

In December, the British Ministry of Food agreed to purchase the whole of Australia's exportable surplus of sugar at an increased price of £2 5s. per ton on all sugar shipped after 1st January, 1946; a freight rebate of 12s. 6d. per ton was also agreed upon in respect of the 1946 crop.

The fertilizer supply position has continued to improve and it seems likely that rationing will be discontinued after this calendar year. At a conference attended by the Director in Melbourne in June, 1945, Queensland was allocated for 1945-46 some 30,000 tons of fertilizer (including 21,238 tons of sulphate of ammonia) together with such bone dust and meatworks fertilizer as could be made available from Queensland meatworks. Deliveries for the calendar year 1945 were 38,943 tons and are expected to reach 48,000 tons in 1946. During the fertilizer year 1945-46 deliveries were 39,354 tons, made up as follows—

Sulphate of ammonia	19,194 tons
Superphosphate	10,753 „
Meatworks fertilizer	6,790 „
Potash	2,608 „
Nitrate of soda	9 „

Special arrangements were made with the Commonwealth to permit 1945-46 quotas to be delivered during July and August, 1946, where deliveries had been delayed by transport difficulties.

At a further conference held in Melbourne on 24th and 25th June, 1946, the Queensland sugar industry was allotted a 1946-47 quota of 26,000 tons of sulphate of ammonia, and 21,000 tons of superphosphate; a State potash quota of 5,000 tons was arranged later.

On paper, therefore, it may be said that fertilizer supplies are back to normal, but world-wide transport difficulties make impossible a forecast of actual deliveries. It is a matter of importance and interest to the sugar industry that A.C.F. and Shirleys Fertilizers Ltd. will shortly commence the manufacture of superphosphate at a new works situated on the Brisbane River.

The scheme for the return to the sugar industry of a proportion of the tractors impressed for urgent defence works was concluded during the year. Upwards of 400 tractors were impressed following the extension of the war to the Pacific. Of these 159 which had been reconditioned by the Allied Works Council were offered to previous owners of impressed tractors; fourteen of these were rejected and 145 placed with canegrowers.

A serious fire destroyed the boiling house and damaged other sections of the Maryborough Sugar Factory on 29th September, 1945. In addition some three to four hundred tons of sugar were lost. Approximately 33,000 tons of the estimated cane crop of 59,000 tons had been crushed and arrangements were soon made to complete the crushing at other mills. Restoration of the factory was put in hand immediately and it will be available to treat the 1946 crop.

On 4th October, 1945, the Acting Premier (Hon. E. M. Hanlon) announced that the Queensland Government had agreed to the Commonwealth proposals for the renewal of the Sugar Agreement for a further period of five years as from 31st August, 1946. The terms of the new agreement are substantially those embodied in the then current agreement and they were subsequently ratified by a Bill which passed both Houses of the Federal Parliament early in April, 1946.

With the close of the 1945 season the most recently established mill in Queensland, Tully, "came of age" by the completion of its twenty-first crushing. The mill was built by the Queensland Government and completed in 1925 at a contract price of £795,221, and crushed a more or less trial run of 32,000 tons in that year. It has since treated over 300,000 tons of cane in one season. In 1931 the mill was acquired from the Government, on a co-operative basis, by the local suppliers.

A link with the past has been severed by the decision of the owner of the Eagleby Mill to cease operations. Situated some 20 miles south of Brisbane, this small mill, with a "peak" of only 300 tons of sugar, was a survivor of the days of small local mills served by waggon transport of cane.

The appointment of a Royal Commission, to enquire into the practicability and expediency of settling a number of returned ex-servicemen within the sugar industry, was gazetted on 21st February, 1946. The Commissioners appointed were Messrs. J. S. Hutcheon, K.C. (Chairman), H. Freeman, and F. J. Wheeler. If, in the opinion of the Commission, it is both practicable and expedient to place ex-servicemen in the industry, it has been further required to report upon the number of such settlers which might so be placed, the most suitable areas for settlement, and the manner in which it might best be effected.

After a recess of some years, dictated by the exigencies of war, the Queensland Society of Sugar Cane Technologists held the thirteenth conference of the Society in Bundaberg during the period 3rd April to 9th April. A total of 120 delegates attended an interesting and comprehensive review of technical subjects. The resumption of annual conferences of Cane Pest and Disease Control Boards is also planned and a conference set down to meet at Tully at the end of August.

WORK OF THE BUREAU.

On the recommendation of the Advisory Board, Mr. E. R. Behne, Assistant Director and Chief Mill Technologist, was deputed to accompany the Queensland Cane Growers' Council Delegation overseas. Mr. Behne proceeded to the United States by air on 2nd November and returned on 2nd February, visiting Cuba and Hawaii en route. Comprehensive reports of his visit will appear in the Cane Growers' Quarterly Bulletin and the Bureau's News Letter to the mills. Experience and overseas contacts of this nature are unquestionably of the greatest importance to executive and research officers in technical organisations.

All members of the staff who had been absent in the armed forces have now been repatriated and have taken up, or are about to take up, duties with the Bureau. Mr. E. J. Barke, Adviser in Cane Culture, has so far been unable to take up field duties owing to the effects of a war injury, and he has been temporarily seconded to another service.

The distribution of the field advisory staff has now been rearranged as follows:—Cairns district: Messrs. G. Bates, E. V. Humphry, and R. A. Abbott; Johnstone-Tully: Mr. H. G. Knust; Lower Burdekin: Mr. G. A. Christie; Mackay: Messrs. C. G. Story, J. T. Elliott, and E. A. Pembroke; Bundaberg: Messrs. N. J. King, S. O. Skinner, and O. W. D. Myatt; Maryborough-Moreton: Mr. N. McD. Smith.

Mr. R. W. Mungomery has taken up his duties at Head Office and Mr. J. H. Buzacott has assumed control of the Meringa Station in his stead. Mr. C. G. Story is now in charge of the Mackay Station, vice Mr. D. L. McBryde, who has been transferred to Brisbane as Assistant Mill Technologist.

Mr. J. H. Nicklin, Senior Technologist (Engineer), commenced duties in August, 1945, and the subsequent demands on his services have emphasised the wisdom of appointing an engineer to the staff. Mr. C. B. Venton joined the Mill Technology staff at the conclusion of his University course in Applied Science, and Mr. L. R. Brain similarly takes up duties at the end of the year. Unfortunately Mr. J. E. Tesch has resigned to take up a responsible position in Western Australia, while Mr. A. H. Praeger is still associated with the Flax Production Committee.

While the field advisory staff position is now reasonably satisfactory the shortage of technical investigation staff remains acute; efforts to fill positions of Analyst, Assistant Mill Technologists, Assistant Entomologist, and Assistant Plant Breeder have so far been without success. The need for a specialist officer to superintend cane breeding is particularly pressing, as also is another entomologist to carry out extensive trials with the new insecticides now becoming available.

Sectional reports from the several officers supervising specialised phases of the work of the Bureau will be found in the following pages. While the volume of field investigational

work here reported is much below normal the return of officers from national service has enabled increased activity and an expanded programme of field trials is now being put into operation.

A considerable proportion of the work of the Brisbane soils laboratory consisted in the analysis of soils for farmers who sought advice regarding the best use of their inadequate fertilizer supplies, and of soil samples collected in connection with district fertility surveys. The latter have been initiated in three districts and are yielding valuable results; they have aroused interest on the part of mill authorities and two mills sent chemists to the Brisbane laboratory during the last "slack" for tuition in soil sampling and analysis. It is evident that there has been a considerable decline in soil fertility levels, aggravated by the wartime shortage of fertilizer. Programmes initiated during the year include the State-wide establishment of approximately 100 liming trials to check the effect of the serious wartime shortage of this commodity, and the setting out of a number of "minor element" trials to check the adequacy of these soil constituents.

A soil conservation experiment was established on an area of relatively steep slope in the Childers district where the characteristic volcanic hills are showing the ill-effects of long-continued erosion of the soil.

A series of cultivation trials has been instituted in order to check the relative value of existing and modified field practices, including seed bed preparation. Good germination is of primary importance in cane culture and a well-prepared seed bed is essential in the drier areas of the cane belt. The value of preplanting treatment of cane setts, by dipping in fungicides, is also being investigated by the pathologists, with encouraging results.

Shortage of field labour has helped to stimulate interest in improving mechanical equipment and several new or modified implements are briefly described in the account of the work of the field staff.

Use of the standard form of variety trial necessarily restricts the number of farms on which such trials can be placed, with the result that variation in local conditions has often been insufficient to give a true assessment of a variety in a limited time. In an attempt to meet this difficulty there has now been adopted a trial system of planting dispersed trials in which a Latin Square or randomised block is distributed over a number of farms of the same general soil type.

The cane breeding programme, which had been resumed on a full basis, has suffered a severe check on account of the drought. Selection of the 1945 seedlings will be impossible in the stunted plantings at Bundaberg, and has been difficult at Mackay and Meringa; grub damage also complicated the position at Meringa. Moreover, poor arrowing has greatly interfered with the collection of seed for next year's programme.

A considerable change has been effected see (Table VIII.) in the varietal composition of the cane crop. Badila remains the major variety but the position of the next two varieties (P.O.J.2878 and Co.290) is now being challenged by the rapid increase of the Macknade and Mackay seedlings, Trojan and Q.28. Trojan, bred in 1933, comprised 8·2 per cent. (372,000 tons) of the 1945 crop and is being further planted in northern areas. Q.28 was bred in 1935 and last year contributed 293,000 tons, or 6·4 of the crop; it is expected that between 600,000 and 700,000 tons of this variety will be harvested in the Mackay district this season, while it is being extended in southern mill areas.

A number of new local seedlings are now beginning to find favour and will increase the lead established in 1941 when Queensland-raised varieties moved to first place on the basis of country of origin. New Guinea, which held pride of place for so long, is again in second place, with 27·1 per cent., compared with Queensland's 35·1 per cent. (see Table IX.).

The release of personnel from the armed forces has enabled Cane Pest and Disease Control Boards to build up their field staffs to approximately pre-war strength. Field inspections can, therefore, be intensified and a resumption of all-round progress in disease control may be expected. The position is generally satisfactory although the further spread of Fiji disease in the small southern mill area of Rocky Point has necessitated the appointment of a Cane Pest and Disease Control Board in that area. The gumming disease outbreak at Mossman has been kept down, but past experience has demonstrated that it will eventually be necessary to plant the whole area to resistant varieties.

As a result of prolonged dry weather, which both interfered with fumigation and accentuated the effects of root pruning, damage by root-eating grubs was extensive in North Queensland. However, a broad ray of promise of more satisfactory control of this pest has emanated from trials with the new soil fumigant, "Gammexane." The chemical also has promise as an agent for the control of wireworms.

Locusts, which had caused some alarm to canegrowers during the previous two seasons, were not so much in evidence this season; rat damage, on the other hand, was on a slightly higher plane in some northern mill areas.

By virtue of staff shortage the Division of Mill Technology was again unable to conduct any investigational work. Mill visits were made and several special inspections were carried out. The relationship of mill powerhouses to the newly-constituted Regional Boards of the State Electricity Commission occupied the attention of the Engineer to a considerable degree. With the addition of Messrs. Tesch and Venton to the staff it was felt that a programme of research could be undertaken for the 1946 season, and at the meeting of the Mill Research Programme Committee at Bundaberg in April, a programme was adopted in which maceration investigation was given prior importance. Unfortunately the early resignation of Mr. Tesch made this programme difficult to carry out.

The Mutual Control system was reintroduced on a full scale for the 1946 season, whilst the usual standardisation of laboratory apparatus for the mills was conducted.

It is clear that the work of this Division cannot be brought to a reasonable level of satisfaction until an adequate staff of experienced technologists is obtained.

The activities of the Bureau are financed by a levy imposed upon each ton of cane delivered by canegrowers and accepted by the millowners; in addition, the Government subsidises the levy on a £1 for £1 basis up to a maximum of £7,000. The levy imposed for the 1945 season was three-farthings per ton of cane, but it has been necessary, on the advice of the Advisory Board, to increase it to one penny for the 1946 season. Receipts and disbursements for the period under review, and also total receipts and disbursements since the inception of the Sugar Fund in 1900, are set out in Appendix I.

As a matter of general interest, the derivation of the C.C.S. formula, on which the Central Sugar Cane Prices Board's scheme of cane payments is based, is set out in Appendix II.

Appendix I.

"The Sugar Experiment Stations Acts, 1900 to 1941."

SUGAR FUND.

Statement of Receipts and Disbursements from 1st July, 1945, to 30th June, 1946.

Receipts.	£	s.	d.	Disbursements.	£	s.	d.
To Balance	31,832	13	6	By Salaries	12,781	10	4
„ Assessments	14,226	6	3	„ Contingencies	6,345	19	11
„ Endowment	7,000	0	0	„ Bundaberg contingencies	2,159	17	2
„ Bundaberg	847	13	0	„ Mackay contingencies	2,501	9	1
„ Mackay	716	19	9	„ Meringa contingencies	3,687	4	1
„ Meringa	1,288	16	3	„ Balance	28,464	9	4
„ Sundries	28	1	2				
	£55,940	9	11		£55,940	9	11

Statement of Receipts and Disbursements from Inception of Fund, 1st December, 1900, to 30th June, 1946.

Receipts.	£	s.	d.	Disbursements.	£	s.	d.
To Assessments	339,664	8	11	By Disbursements	630,185	14	2
„ Endowment	246,862	3	0	„ Balance	28,464	9	4
„ Sugar Experiment Stations	72,123	11	7				
	£658,650	3	6		£658,650	3	6

Appendix II.

C.C.S. FORMULA.

$$\text{C.C.S. in cane} = \text{Pol in cane} - \frac{\text{Soluble impurities in cane}}{2}$$

In practice, per cent. C.C.S. is calculated by the empirical formula—

$$\text{C.C.S.} = \frac{3P}{2}\left(1 - \frac{5 + F}{100}\right) - \frac{B}{2}\left(1 - \frac{3 + F}{100}\right)$$

where—

P = pol in first expressed juice.
B = brix in first expressed juice.
F = fibre in cane.

Division of Soils and Agriculture.

WORK OF THE BRISBANE LABORATORY AND EXPERIMENT STATIONS.

By L. G. Vallance, Chemist.

Analytical Work.

The following is a summary of the analytical work performed at the Brisbane Laboratory for the period 1st July, 1945, to 30th June, 1946:—

Soils	619
Waters	27
Muds	1
Ashes	3
Miscellaneous	4
Total	654

Investigational and Advisory Work.

During the year the results of some 600 soil analyses were forwarded to growers, together with the required fertilizer and liming recommendations. As was the case last year, the majority of the soils analysed were from areas in which fertility surveys were carried out. This type of survey, in which a systematic evaluation of the fertilizer requirement of various farm blocks is made at or about harvest time, is proving to be of considerable benefit to growers in whose areas the surveys have been initiated. It has also created appreciable interest on the part of mill authorities in several mill areas, and during the year the Bureau was pleased to provide laboratory accommodation and tuition in soil analytical procedure for two mill chemists. It is hoped that the co-operation of these officers with the Bureau staff will result in an extension of this type of work in the future.

The interest and assistance of these mills is greatly appreciated, particularly in view of the decline in soil fertility which has been seriously aggravated by the shortages of fertilizer. The most efficient use of fertilizer for replenishing the depleted plant food content of sugar lands is a question of major importance. Attention is again drawn to the fact that the soil-testing service provided by the Bureau can be of material benefit in assisting growers to decide upon the correct fertilizer to use as this essential commodity becomes more freely available. Farmers in all districts are strongly urged to take the fullest advantage of these facilities.

In order to obtain further information regarding the value of the application of lime to cane lands, a comprehensive series of lime trials has been commenced. This is being carried out in conjunction with various field officers of the Bureau, and involves the establishment of experimental plots on approximately 100 individual growers' properties. The fertilizing value of mill mud is also being studied and experiments are being set out to ascertain the response to various amounts of mud, when used prior to planting in combination with different types of commercial fertilizers. The fertilizer plus minor element trials, involving the addition of small amounts of copper, zinc, manganese or boron to the usual fertilizers, have been continued, and extended to areas not previously tested for minor element deficiency.

During the year the problem of soil erosion on sugar cane lands in the Isis district was given a considerable amount of attention. An exploratory trial designed to investigate suitable methods of control was laid down in this area early in January. It is hoped that this work will provide useful information from which practical recommendations may be evolved for the control of the erosion which is so prevalent on many of the steeply sloping fields of this district.

Fertilizer Rationing.

Although it was necessary to continue the rationing of fertilizer, it is pleasing to note that the quota allotted to Queensland for the year ending December, 1946, allows of substantially increased amounts being available to growers. It has been possible to supply the greater proportion as "mixtures" instead of "straights," and from June to December of this year no fewer than six different mixtures will be available. This desirable feature gives the individual grower a wider choice in selecting the most suitable fertilizer for his particular soil type. Unfortunately, it is not yet possible to return to the original formulae of the mixtures evolved by the Bureau as the result of many years of field experimentation and soil analytical work.

Publications.

The following article was published during the year—"A Soil Erosion Control Experiment in the Isis District," by L. G. Vallance, Proceedings of the Queensland Society of Sugar Cane Technologists, 1946.

NORTHERN SUGAR EXPERIMENT STATION, MERINGA.

(Mr. J. H. Buzacott, Entomologist, Officer in Charge.)

Meteorological and Crop Growth Reports.

Following the exceptionally wet first half of 1945, the second half of the year was characterised by an unusually dry spring and summer. The lower blocks, where there was a high water table, did not suffer greatly from this, but on the higher lands, particularly the red schists and red volcanics, the crops suffered severely and made very little headway. Good rain did not fall until towards the end of December, when the position was greatly relieved. Due to this dry spring and early summer, the planting of legume crops had to be generally delayed until December, and the resulting crops were mainly killed out by wilt; even the Giant Cowpea succumbed to this disease. January and February, 1946, were marked by good rain, whilst heavy rain fell during the first week of March. A complete cessation of rainfall and a series of abnormally high temperatures for the remainder of the month adversely affected the further growth of the cane. A heavy wind during February and a minor cyclone in early March caused advanced crops on the Experiment Station to lodge badly, and prevented the use of the mechanical injector for grub destruction on such blocks. From the day of the cyclone on the 2nd March until the 30th June, less than four inches of rain fell, whilst the rainfall for the April, May and June period, which was only 2·73 inches, was the lowest recorded since 1932.

Fairly heavy damage was caused by grubs of *L. frenchi* during the summer months, and this was accentuated by the dry weather. Infestation with grubs of *D. albohirtum* occurred during February and March, 1946, and these caused widespread and serious damage. Due to the lack of rain in March and April, it was possible to do only very little fumigation, and consequently losses due to grub attack were very heavy. There is no doubt that lack of plant food in the soil and lack of adequate leguminous crops over the war years are now showing a profound effect in inability of the canes to withstand checks due to minor grub attack or dry weather. Fertilizer is generally still in insufficient supply, and due to industrial and transport difficulties it will probably continue to be so for some considerable time. The high price and scarcity of cowpea seed, together with its problematical growth when sown, have caused many farmers to leave their land in bare fallow. Also, for several years, farmers who practised trash conservation have been denied that method of improving soil due to the pre-harvest burning of cane, which has now become universal.

Generally speaking, the labour position in the district has eased considerably, although there is still difficulty in obtaining an adequate number of competent cane cutters.

In the following tables are shown the rainfall records taken at the Northern Sugar Experiment Station over the last 21 years, with an abstract of other meteorological observations:—

Rainfall Records, 1925-1946.

Year.	Rainfall Inches.	Year.	Rainfall Inches.
1925	76·98	1936	88·81
1926	59·12	1937	46 33
1927	90·16	1938	55·86
1928	66·33	1939	118·08
1929	102·28	1940	84·58
1930	107·61	1941	84·65
1931	98·82	1942	60·14
1932	76·31	1943	47·31
1933	96·06	1944	60·73
1934	91·44	1945	117·60
1935	59·91	1946 (6 months)	52·01
		Average for 21 years	**80·43**

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT NORTHERN SUGAR EXPERIMENT STATION, MERINGA, FROM 1ST JULY, 1945, TO 30TH JUNE, 1946.

Month.	Rainfall (Inches).	Number of Wet Days.	Shade Temperatures.						Mean Diurnal Range.	Mean Temperature 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum.			Minimum.					
			High.	Low.	Mean.	High.	Low.	Mean.			
1945.											
July	1·28	17	86·5	73·3	78·7	66·2	40·7	59·7	19·0	70·33	81·0
August	0·18	4	91·7	78·8	84·4	66·1	47·5	58·7	25·7	74·53	75·0
September	0·06	2	96·5	81·8	86·5	68·2	51·5	60·4	26·1	76·9	73·0
October	1·29	14	92·0	81·0	88·7	71·0	53·0	63·7	25·0	81·43	72·0
November	0·77	12	99·0	83·5	91·4	74·0	63·5	67·6	23·8	85·2	69·5
December	8·36	13	97·0	85·0	91·57	75·0	65·5	70·46	21·11	86·0	71·0
1946.											
January	17·07	21	95·0	82·0	90·61	77·7	63·5	73·18	17·43	85·89	79·0
February	24·55	23	98·0	82·5	89·65	76·0	68·0	73·35	16·3	84·34	87·0
March	7·66	10	100·0	81·5	92·04	75·5	62·5	69·98	22·06	84·68	79·0
April	0·66	8	94·5	83·0	88·58	72·5	50·0	62·76	25·82	78·63	78·0
May	1·77	14	90·0	80·5	85·23	70·0	45·5	62·33	22·8	76·18	81·0
June	0·30	7	87·5	74·0	81·21	66·2	35·5	52·0	29·21	67·2	74·0
Totals	63·95	145	..	..	..	..	..	..	..	..	..

Work of the Station.

Experiments Harvested During the 1945 *Season.*—The major portion of seedling selection was again made on the ratoon crop, whilst a few only of the most outstanding varieties were selected from the plant seedlings. The usual seedling trials were harvested during the year and these included two preliminary yield-observation trials and two quantitative trials, each of the latter being set out in the form of a 5 x 5 Latin Square. The plant crop of the yield-observation trial which contained the "D" series of seedlings showed some promising new canes. Final selections, however, will not be made until the results of the ratoon crop are obtained. In the meantime, the more impressive have been planted out in farm plots in order to gain additional information regarding their behaviour on different soil types. The first ratoon crop of the "B" seedlings was also harvested. Of these, six showed sufficient promise and were selected for further testing, whilst two were retained for breeding purposes because of their parentage. The rest were discarded.

The Latin Square plant crop trial, in which the varieties Q.13, Q.44, Trojan, P.O.J.2878 and the seedling B.232 were being compared, was harvested in October. The C.C.S. figures for the standard canes were very good, ranging from 17·8 in Trojan to 19·4 in Q.13. Trojan and Q.44 produced the greatest amount of sugar per acre, both considerably outyielding P.O.J.2878 and Q.13. The seedling B.232 performed reasonably satisfactorily in this trial, and is an excellent cane agriculturally, but its rather low sugar content may cause its discard. The Latin Square ratoon trial comprising three new canes of the "A" series of seedlings with Q.13 and P.O.J.2878 showed no significant results. However, previous observations and results from farm plots have caused the seedling A.224 to be considered worthy of a place as a commercial cane and it has therefore been designated Q.53. The other two canes, viz., A.233 and A.278, have been discarded.

The Station's part in the annual cross-pollination programme involved a considerable amount of work. A discussion on this aspect, together with the raising of original seedlings, will be found in the "Report of the Committee on Seedling Propagation" given elsewhere in the Annual Report.

During the year experimental work on pest and disease control was also carried out on the Station, the results of which are discussed in the "Report of the Division of Entomology and Pathology."

Legume Trials.

A small amount of seed of several new leguminous plants was received for testing purposes. The varieties included *Crotalaria sericea* (*spectabilis*), *Crotalaria intermedia, Crotalaria incana,* "Ingham" pea, Pigeon pea, Fenugreek, Tangier pea, and in addition a small amount of Cowpea No. 1582 was planted to maintain a supply of seed of this strain. The following comments are offered on the growth of these species of legumes at Meringa:—

Crotalaria sericea.—The species has much larger leaves and gives better early cover than other species of Crotalaria grown here. It was planted under the harsh conditions of a dry spring, but in spite of this it made good growth. Since only a very small amount of seed

was received for trial, we were primarily interested in producing sufficient seed to make more extensive plantings. The plants flowered and seeded freely, but practically 100 per cent. of the seed pods were damaged by the larvae of two species of moths and a *Lycaenid* butterfly. Not until the plants were sprayed with a 0.2 per cent. "Gammexane" solution was it possible to harvest any seed. After spraying, sufficient seed was harvested to make slightly larger plantings during the coming year.

Crotalaria intermedia Kotschy.—The experimental plantings gave little promise. In common with Gambia pea and *Crotalaria usaramoensis,* the variety gave a delayed germination, whilst its narrow leaves afforded very poor cover, even when the plants were well grown. When mature, *C. intermedia* resembles *C. usaramoensis,* except for its narrower leaves, but generally speaking it appears far inferior to the latter variety as a cover crop.

Crotalaria incana.—The small planting made did not germinate, consequently no comment is made regarding this variety.

Ingham Pea.—This legume somewhat resembles Poona pea, but has a climbing habit. Tried in two different soil types, the species produced growth comparable with Poona pea in both plantings. It seeded some two or three weeks later than Poona pea, and seed was harvested for further plantings during the coming year.

Pigeon Pea (*Cajanus indicus* Spreng.).—A very slow germination occurred and the early growth was likewise slow. It is not considered that this legume would be suitable for any but a long fallow, and then its woody nature and slow early growth and consequent poor cover would be features operating against its use as a green manure in sugar areas.

Fenugreek (*Trigonella foenumgraecum* L.).—Plantings of this species seeded when only six inches high, producing both inferior cover and poor vigour; consequently, further plantings were not made.

Tangier Pea (*Lathyrus tingitanus*).—The seeds of this pea were planted during early April. Germination and early growth were very slow, so that when three months old the plants were only six inches high. This appears to be another legume which is unsuited to North Queensland conditions where the competing weed growth is so rapid that any legume planted as a green manure requires to produce good early cover in order to survive.

Cowpea No. 1582.—The crop grew quite well, and seeded freely, flowering approximately three weeks after Poona pea planted at the same time. Arrangements are being made for the seed which was harvested to be propagated commercially in a dry area.

Laboratory Work.

The following is a summary of the analyses carried out during the year:—

Cane (maturity tests and Experiment Station samples)	332
Cane (farm trials)	183
Cane (growers' samples)	5
Soil (lime tests)	16
Soil (moisture determinations)	14
	550

Crop Summary.

Cane sent to mill	471·2 tons.
Cane used for plants, samples, &c.	24·4 tons.
	495·6 tons.
Total area harvested	18·87 acres.
Tons per acre harvested	26·26
Class of cane—	
Plant cane	36 per cent.
Ratoon cane	64 per cent.

CENTRAL SUGAR EXPERIMENT STATION, MACKAY.

(Mr. D. L. McBryde, Officer in Charge.)

Meteorological and Crop Growth Reports.

Because of the dry weather experienced for several months just prior to the commencement of the year under review, practically all crops in the Mackay district were in a very backward condition as the 1945 harvest season approached. In many fields little or no cane stalk was evident and mill estimates were reduced considerably below that of normal seasons. However, the winter of 1945 was generally mild and useful rains occurred at intervals during the period from June to October. With the onset of spring the cane began to grow, with the result that the tonnage of cane harvested was greater than was anticipated. Unfortunately, as would be expected, this late growth resulted in much of the cane being abnormally immature when harvested and the increase in tonnage was considerably offset by the unusually low sugar content. Moreover, because of the immaturity of the crop, most mills encountered greatly increased trouble in the milling process, particularly in clarification.

The excellent growing conditions were maintained and both spring planted and ratoon crops came away well, good growth continuing throughout the greater part of the wet season. However, early in March the rain culminated in severe cyclonic storms, with the result that large areas of cane lands were completely inundated for several days. Although serious damage occurred to crops in many parts of the district, it was fortunate that the cyclonic disturbance was not accompanied by strong winds, otherwise the more forward crops, in particular, would have suffered much greater destruction.

Grasshoppers made their appearance from local egg beds during the early summer months, but no losses in crops were reported. Although some damage due to wireworms occurred on the lower lands on the Station, the favourable weather allowed these fields to be satisfactorily supplied.

The rapid displacement of the older cane varieties by Q.28 has been maintained and this cane has considerably improved its position as the major cane of the district. Another new cane, Q.50, is also showing excellent promise.

The following meteorological observations were made at the Station during the year. The rainfall records (also given below) prior to 1935 were made at the old Sugar Experiment Station, Lagoons, but since that date have been taken at the site of the present Station at Te Kowai.

Abstract of Meteorological Observations Made at the Central Sugar Experiment Station, Mackay, during Period 1st July, 1945, to 30th June, 1946.

Month.	Rainfall (Inches).	Wet Days.	Average Rainfall (Inches).	Shade Temperatures.					
				Maximum.			Minimum.		
				High.	Low.	Mean.	High.	Low.	Mean.
1945.									
July	4·07	15	1·40	76·0	62·0	72·1	64·0	39·0	53·1
August	0·13	4	1·00	88·0	69·5	78·4	63·5	44·0	53·5
September	1·23	6	1·63	91·5	73·0	80·8	71·5	46·0	56·1
October	7·68	11	1·81	87·5	71·0	81·9	71·0	46·5	61·4
November	1·68	18	30·6	91·5	80·0	85·0	70·5	58·5	65·2
December	3·83	12	6·84	93·0	82·0	87·7	74·5	63·5	71·3
1946.									
January	18·73	17	13·70	94·0	76·0	86·3	76·5	63·0	71·6
February	5·38	21	11·81	90·5	79·5	86·7	77·0	67·5	72·1
March	23·14	7	10·93	95·5	76·0	86·4	73·5	61·0	68·6
April	0·43	5	53·4	94·0	82·0	85·6	69·5	47·0	59·0
May	2·16	7	3·14	84·5	72·5	80·8	67·0	43·5	57·3
June	0·06	1	2·56	83·5	70·0	75·8	60·0	35·0	43·9
Totals and Average	68·52	124	63·23	..	..	..	..	..	..

ANNUAL RAINFALL SINCE 1920 AT THE SUGAR EXPERIMENT STATION, MACKAY.

Year.	Rainfall Inches.	Year.	Rainfall Inches.
1920	57·27	1934	37·57
1921	95·89	1935	45·15
1922	34·47	1936	97·37
1923	25·23	1937	56·60
1924	53·37	1938	52·18
1925	54·80	1939	56·14
1926	34·60	1940	84·97
1927	83·87	1941	71·38
1928	72·28	1942	77·92
1929	64·03	1943	60·11
1930	55·81	1944	53·16
1931	30·01	1945	46·76
1932	48·48	1946 (6 months)	49·90
1933	71·94	**Average 26 years**	**58·51**

Work of the Station.

Experiments Harvested during the 1945 *Season.*—The very dry weather in the spring and early summer followed by the mild winter of 1945 so affected the crops on the Station that selection in the seedling trials was very difficult and inconclusive. The plant cane of the yield-observation trial on Block B.2, although fifteen months old when harvested in mid-October, was still very immature. In this trial eight new seedlings were tested against Q.28 as a standard. However, this popular standard cane considerably outyielded the newer canes, most of which made a very poor showing under the rather abnormal seasonal conditions. The ratoon yield-observation trial on Block A.5 was so severely affected by drought that the trial had to be abandoned and the seedlings were replanted for further observation under more reasonable conditions.

The plant crop of the Latin Square varietal trial on Block B.2 was also poorly grown and immature when harvested in October. Of the four canes tested only one, B.174, seems to have possibilities. This cane maintained the characteristics shown in the preliminary trials of self stripping, together with good sugar content and very fair yield per acre. However, the block will now be ratooned and further observed before final selections are made. The first ratoon crop of another Latin Square varietal trial was also harvested during the year. In this trial two new canes, A.130 and A.147, showed considerable promise when compared with Q.28 as standard. These have now been planted out in plots on growers' properties for final testing as commercial canes.

Experiments Initiated during the Year.—The experimental plots planted out during the year were again confined to those required by the normal sequence of seedling raising and the preliminary and Latin Square varietal trials.

Laboratory Work.

The following is a summary of the cane samples submitted to the laboratory for testing:—

Cane Samples—	
Maturity tests on station samples	198
Show canes	36
Total	234

SUMMARY OF CROPS HARVESTED ON STATION.

Total cane harvested	359·2 tons
Total area harvested	21·5 acres
Average tons per acre	16·7
Class of cane—	
Plant	191·7 tons
Average per acre	20·0
Ratoon	167·5 tons
Average per acre	14·1

SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG.

(Mr. N. J. King, Senior Adviser, Officer in Charge.)

Meteorological and Crop Growth Reports.

The winter of 1945 was not a cold one, but a few very sharp frosts were recorded, and these damaged a fair amount of cane even in the more elevated areas of the Bundaberg district. A very dry autumn had been experienced and rather severe frosting had been anticipated. This was prevented to some extent, no doubt, by a fall of four inches of rain in mid-July. This July rain was followed by the normal dry spring experienced in South Queensland, but the dry spell was not followed by the usual late spring and early summer storm rains. Instead a very dry November and December followed, and these were succeeded by January, February and March rain aggregating only 10.7 inches. For the four months December to March the total precipitation was 11.83 inches contrasted with the average for this period of 25.34 inches. As this is the normal period of highest temperature and best growth, it can be readily appreciated that crop growth was very poor under the prevailing low soil-moisture conditions. At no time during December, January and February did the rain penetrate more than 10 inches into the soil. April and May combined gave a rainfall of only 3.28 inches, while the month of June was entirely rainless. By the beginning of June all crops on non-irrigated lands were parched and drought-stricken and dead cane could be found in most fields. In June a succession of early frosts caused havoc in the crops—the frosts being some of the severest on record. Seventeen frosts were recorded during June and grass readings reached a minimum of 24° F. Very little green cane remained on the dry-farmed areas, and even in these green crops examination showed that the growing point was dead. The district can rarely have experienced such a severe combination of drought and frost.

Two cyclonic disturbances, one in early and one in late March, 1946, did not relieve Bundaberg's drought but the Moreton area benefited considerably from heavy, soaking rains. A severe hail storm, accompanied by cyclonic wind, passed through a section of the Woongarra lands during this month. It caused severe damage to crops, houses and outbuildings, and telephone lines. Cane crops were completely stripped of all foliage and the rind was removed from the cane stalks on the side from which the hail came. Other crops less severely affected had the tops broken off and subsequently all side buds shot.

In general it may be stated that of all varieties P.O.J.2878 suffered worst, from both drought and frost; Co.290 is always affected by dry conditions, but it is less damaged by frosty weather. The newer canes, Q.42, C.P.29/116 and Q.49, grew better during the dry year, and once again the Q.42 has demonstrated its quality of frost resistance except where affected by very severe freezing. Q.49, where grown, has been outstanding, and planting forecasts indicate that the major proportion of this year's planting will be done with C.P. 29/116 and Q.49, provided sufficient plants are available. The drought and frost took heavy toll of cane for planting purposes, and it would appear as if the large bulk of plant supplies will have to come from a relatively small number of irrigated properties.

The following are the rainfall records taken at this Station since it began operations in 1914. To conform with the year covered by the report, the rainfalls are given for the growing season beginning in July and ending in June; an abstract of the meteorological observations made at the Station during the year is also appended.

Rainfall Records, 1914-1946.

Year.	Rainfall Inches.	Year.	Rainfall Inches.
1914-15	31·99	1930-31	47·19
1915-16	28·54	1931-32	22·88
1916-17	58 08	1932-33	36·81
1917-18	49·85	1933-34	71·45
1918-19	24·24	1934-35	40·01
1919-20	28·20	1935-36	44·24
1920-21	45·16	1936-37	31·65
1921-22	44 97	1937-38	44·40
1922-23	37·14	1938-39	41·01
1923-24	34·16	1939-40	41·69
1924-25	50·96	1940-41	43·26
1925-26	37·62	1941-42	33·52
1926-27	68·18	1942-43	40·75
1927-28	74·69	1943-44	45·22
1928-29	31·16	1944-45	28·14
1929-30	43·16	1945-46	26·10

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG, FROM 1ST JULY, 1945, TO 30TH JUNE, 1946.

Month.	Rainfall (Inches).	Wet Days.	Shade Temperatures.						Mean Diurnal Range.
			Maximum.			Minimum.			
			High.	Low.	Mean.	High.	Low.	Mean.	
1945.									
July	3·98	4	77	68	71·3	62	34	48·3	23·0
August	0·39	1	82	64	76·4	63	32	51·0	25·4
September	2·51	4	80	71	76·8	67	38	52·2	24·6
October	2·01	5	86	73	79·1	65	40	57·6	21·5
November	2·10	5	96	79	84·5	72	55	62·9	21·6
December	1·12	4	91	82	86·4	75	63	68·4	18·0
1946.									
January	3·46	7	94	82	86·2	80	61	71·6	14·6
February	1·56	11	92	85	88·2	75	67	71·4	16·8
March	5·69	10	92	75	84·1	72	59	65·9	18·2
April	2·89	3	84	77	80·8	71	49	58·1	22·7
May	0·39	2	85	74	78·7	64	46	54·0	24·7
June	..	..	77	64	71·8	58	33	41·8	30·0

General.

Plant Distributions.—During spring 1945 the varieties Q.48 and Q.49 were distributed to all growers who applied for them in the Qunaba, Millaquin, Fairymead, Bingera and Gin Gin areas. Approximately 500 tons of each variety were thus distributed. Q.49 became an immediate favourite by reason of its excellent striking and ratooning ability, its attractive growth habit and its known standing-over qualities. Q.48 is less favoured by the majority of growers. It is brittle and easily broken by implements, is not a satisfactory standover type, and in addition it is very susceptible to red rot. The variety Q.47 is being propagated on farms for the purpose of distribution in the spring of 1946 if sufficient plant supplies are available. Simultaneously Q.28, Q.51, and Q.52 are also being propagated on farms for farm variety trials, and their future will depend largely on the results of such experimental plantings on a variety of soil conditions.

The only new varieties introduced from quarantine during the year were A.130 and B.254.

The establishment of isolation plots in the Isis and Moreton districts now allows of new releases being sent to those districts from Bundaberg in fairly large amounts instead of only a few plants being sent from Brisbane quarantine house. This method saves considerable time in propagating supplies in those areas, while at the same time the isolation plot is a safeguard against introducing any disease from one area to another. Already the Moreton isolation plot has handled supplies of Q.47, Q.48, Q.49, Q.51 and Q.52, while the Isis plot has received Q.49, Q.51 and Q.52. The Maryborough and Bauple areas have in the past year received supplies of Q.49, Q.51 and Q.52 for propagation.

Experiments Harvested during 1945 *Season.*—The testing of new varieties again formed a major part of the experimental work carried out on the Station. During the year two yield-observation trials were harvested. These trials, which are of a preliminary nature, were designed to compare the performances of a number of new seedlings with those of standard varieties. As one of these trials has completed its plant and first ratoon crops the most promising new canes were selected and these, namely, B.30 (now Q.52), B.50 and B.56, will now undergo quantitative trials before final selection for release to farm propagational plots is made. It may be mentioned that because of its very erect growth and regularity of stalk length, B.50 suggests itself as a variety suitable for machine harvesting. The second trial, which was a plant crop harvest, will be ratooned before selections are made. However, one of the seedlings, D.15, shows considerable promise and has the added advantage of being almost self-stripping.

The plant crop from a 5 x 5 Latin Square varietal trial was also harvested. This quantitative trial, which was planted in the spring of 1944, was designed to test several modern seedling canes against the old standard, M.1900 Seedling. With one exception (Q.25) these new canes, namely, Q.42, Q.49, Q.52, considerably outyielded the older variety in both tonnage of cane and sugar per acre. The first ratoon figures from another varietial trial in which three new seedlings, A.16, A.24, and A.26, were being tested against Co.290 were obtained. However, since none of these new canes showed any advantage over the standard cane, either

in the ratoon or in the plant crop, they will not be carried forward into farm trials. It is interesting to note that the Hawaiian cane, 32-8560, which had also been included in this experiment, did not compare at all favourably with the other varieties in the trial.

A slight response to potash fertilization and no response to phosphoric acid was indicated by the plant crop yields of a fertilizer trial which was harvested on Block B.3. In this trial two levels of potash and phosphoric acid were used, corresponding to 3 cwt. and 6 cwt. per acre of No. 3 Mixture. This block which is planted to C.P.29/116 will now be ratooned in order to obtain further information regarding the fertilizer requirement of this important variety.

The harvesting of the first and second ratoon crops on Block B.4 completed the second cycle of the rotational trial. This long-range experiment was first planted in autumn 1938. It was designed to provide information as to the value of long versus short fallowing in the red volcanic soils of the Woongarra and similar areas. As the design has been fully described in previous Annual Reports, the following brief description of the layout will suffice. The trial consists essentially of three rotational treatments—

(1) 18 months fallow with legumes followed by a plant and one ratoon crop of cane;

(2) six months fallow with legumes followed by plant, first and second ratoon crops; and

(3) similar to (2) but in the replanting of the trial at the end of the four-year cycle the original variety P.O.J.2878 was replaced by a fresh variety, viz., Q.25.

The results to date show that the total yield from the two cycles of rotation (1) (plant plus one ratoon) is about 25 per cent. less than the total yield of the two cycles of either rotation (2) or (3) (plant plus two ratoons). It is quite evident therefore that the longer period of fallow during the eight years that the trial has been conducted has not benefited the soil to the extent that it compensates for the loss of one crop per cycle. It is interesting to note, however, that the loss in yield due to the omission of one ratoon crop in the long fallow rotation was less marked in the second cycle than in the first. Moreover, there was an indication (not statistically significant) that the change of the variety was accompanied by a slight increase in yield. This suggests the probability of a long fallow plus two crops ultimately equalling, and possibly surpassing, the yield of a short fallow plus three crops. Admittedly, at the moment, it is only a suggestion; however, it is felt that this type of trial is well worth persevering with, particularly in view of the restricted soil rejuvenation methods possible under the assignment system.

Because of the long-range nature of the experiment the opportunity was taken to combine a potash trial with the rotations. Once more the fact that potash fertilizer is an essential requirement of the Bundaberg red volcanic soils was amply demonstrated. As would be expected, on previously well fertilized soils, the response was less marked in the first cycle than in the second. The results show that, in this latter cycle, three annual dressings, each consisting of 150 lb. muriate of potash, increased the total yield of the plant, first and second ratoon crop by approximately 29 tons of cane per acre.

Experiments Initiated during the Year.—A quantitative trial designed to ascertain the value of such minor elements as copper, zinc, manganese and boron when applied in conjunction with the usual fertilizer mixture was set out on the Station during the year. This was supplemented by several observational trials laid down on the various soil types occurring in the district. An observational yield trial to compare several new seedlings with Co.290 as standard was commenced, while a quantitative Latin Square varietal trial, which includes Q.28, Q.49, Q.52, B.50, and B.56, has also been planted.

Because of the extraordinary results obtained from the plant and first ratoon crop yields of the "Quality of Planting Material Trial" referred to in last year's Annual Report, it was decided to repeat this experiment, and accordingly the layout previously used was again planted out during the year. This very interesting trial was designed to compare the yield obtained from P.O.J.2878 plants which had been grown in a phosphate-rich soil with those taken from a phosphate-poor soil. (The amount of cane harvested from the phosphate-poor plants in both the plant and ratoon crops of the previous trial was practically twice that obtained from the phosphate-rich plants. These results were strikingly different to those which were expected.)

With the continued dry weather, the Station irrigation water supply failed completely, and the 6,000 seedling canes, which were planted in early November, were entirely dependent upon rainfall. Unfortunately, the remainder of the year was characterised by one of the severest droughts on record, and in consequence the seedlings, which were the result of last year's breeding programme for the southern districts, were a total loss.

Laboratory Work.

Since the extension of electricity services to the Experiment Station, the equipment of the laboratory has gradually been improved to facilitate the handling of the general soils and water analyses required by the district. Included in recent equipment were a glass electrode—valve potentiometer outfit, an electric muffle furnace, and an electric oven. A large number of soil and water analyses have been carried out. At the moment, with the exception of those samples requiring an acidity determination only, the majority of farmers' soil samples are still sent to the Brisbane laboratory. The soil analytical work at the Station was carried out for the purposes of a systematic survey of the various soil types of the Bundaberg district, which is at present in progress under the direction of Mr. King. This work, unlike the fertility type of survey, requires an examination of the complete soil profile, and is intended to provide fundamental data which will be extremely useful in the not unlikely event of the intensification of irrigated farming in the Bundaberg district.

The number of laboratory samples handled during the year are summarised as follows—

Cane Samples—	
Station	307
Farmers	143
Irrigation waters	78
Soil survey samples	102
Total	630

Summary of Crops Grown on Station.

	Tons.	Cwt.	Qr.
Varieties harvested 1945 season—			
P.O.J.2878	43	12	1
Q.25	29	3	0
Co.290	4	0	0
C.P.29/116	111	0	3
Q.42	18	19	2
Seedlings	215	18	0
Total	422	13	2
Plant cane harvested	225	4	2
First ratoon cane	152	13	3
Second ratoon cane	44	15	1
Total	422	13	2
Total acreage harvested 17·086.			
Total cane harvested for mill	422	13	2
Used for plants on station	16	0	0
Used for plants off station	7	2	0
Used for samples	3	0	0
Total Crop	448	15	2
Average tonnage per acre 26·27.			

WORK OF THE FIELD STAFF.

By W. J. S. Sloan, Agronomist.

The work of field officers for the year was chiefly concentrated on varietal observational trials and propagation, supervision of fertilizer rationing, the restoration of the pre-war standard of advisory services, and the inauguration of an expanded experimental programme for harvest in 1947.

Mr. E. V. Humphry, formerly field assistant at Bundaberg, was transferred to Meringa Sugar Experiment Station, while the field staff was strengthened during the year by the return of several officers from the forces. Mr. G. A. Christie was appointed Adviser in Cane Culture at Ayr; Mr. C. G. Story, Adviser in Cane Culture, after several months at Bundaberg, took charge of the Sugar Experiment Station at Mackay, in June, 1946. Mr. S. O. Skinner, Adviser in Cane Culture, resumed duties at Mackay, but was subsequently transferred to Bundaberg; and Mr. N. McD. Smith, Adviser in Cane Culture, was stationed at Nambour. The addition of these officers will enable the Bureau to widen the scope of activities which were curtailed during the war.

The 1945 Harvest.

The winter of 1945 was comparatively mild and frost damage to standing cane was negligible. On occasions, harvesting was interrupted by rain, but generally shortage of labour was more important in this regard. The wet season in several far northern areas was longer than usual, and extended into the winter, while in the Central District, late winter and early spring rains stimulated new growth in standing cane, particularly the variety Q.28. Although the cane tonnages harvested in the latter district were larger than originally expected because of additional growth, this was offset to a large degree by the low C.C.S. in late cut fields. The southern mill areas cut close to the estimates. Overall, the Queensland harvest was slightly above estimate.

Growth of the 1946 Crop.

Generally, throughout the sugar growing belt, conditions for planting and ratooning in 1945 for the 1946 crop were fair. Early growth was reasonably good in most areas and by February 1946, harvest prospects were favourable, particularly in the central district, but to a lesser extent in the southern districts. Cyclonic winds and floods in early March from Mackay north, frosts in June from Mackay south, and cane grub damage in the far northern districts, combined with drought in all districts altered the position very materially, with the result that it was clear by the end of June that prospects for a good harvest in 1946 had vanished. Furthermore, cold conditions and low soil moisture restricted autumn plantings in many mill areas and impeded seed bed preparation for 1946 spring plantings.

Details of crop progress in the main cane growing areas are as follows:—

Northern Districts (Ayr to Mossman).—The season was generally unfavourable throughout these districts and Cairns-Mossman experienced one of the worst seasons on record. Crop progress during the first half of the season was fair, although the spring months were very dry, and the state of crops in February indicated an average harvest. However, cyclonic winds and floods in early March followed by abnormally dry weather, and widespread grub infestation in several far northern mill areas, caused a sharp drop in all mill estimates by the end of June.

The first cyclone occurred in early February, but with the exception of several isolated localities, did not cause much damage to cane fields. The second cyclone in early March was accompanied by very high floods in places and caused considerably more damage. Many acres of cane land in the Lower Burdekin were scoured or heavily sanded by flooding which followed breaks in the river banks. Damage to farm buildings, irrigation installations, and farm equipment was also extensive. Shortages of material have impeded repair work.

Unusually dry weather followed the early March floods, although showers occurred in April with useful planting rains in May in some far northern mill areas. Continued dry weather checked the progress of the young plant cane of the 1947 crop, as well as causing the 1946 crop to deteriorate.

Central District (Proserpine-Mackay-Sarina).—With favourable temperatures and good soil moisture conditions, excellent germinations were obtained from the plantings in 1945. Well distributed rains in the following late spring and summer promoted rapid growth of the cane and in February, 1946, there were excellent prospects for high yields in all mill areas. Severe flooding in early March, fortunately, did not cause directly a great deal of damage to cane fields, but indirect effects were considerable. Waterlogged soils induced surface rooting, with the result

that many cane crops soon showed distress during the dry weather which followed, and growth was severely checked. A series of frosts in early June caused much damage to standing crops in all the low country, extending to areas which had previously been little affected.

The drought from March to the end of June was unbroken except for scattered rains in early May, which, athough sufficient for planting, provided little real relief to standing crops. By the end of June, cane stalks were in many cases pithy and in some instances dead. Maturity sampling at this period showed abnormally low C.C.S. values and indications were that the 1946 harvest would be little better than average.

Southern Districts (Bundaberg to Rocky Point).—The Bundaberg-Isis-Maryborough area experienced one of the worst seasons since cane growing commenced in those districts. Strikes from the 1945 plantings were fair, but at no stage during the growing season were rains sufficient to favour rapid growth. The excellent progress in irrigated crops was in marked contrast, although numerous waterings were required to keep the crops moving. Prospects of an average yielding crop were fair in February, but thereafter drought, and early frosts in late May followed by many frosts in June, caused rapid deterioration of the already backward crops; in many fields no cane will be harvested. Most mills expect abnormally low crushings.

Varietal Trials.

Owing to staff shortages in 1944, only a limited number of varietal trials were set out for harvest during the year. The results are summarised as follows:—

In the first ratoons of a trial at Gordonvale cut at 11½ months, Comus, Cato and H.Q.426 each out-yielded Q.10 and Q.13, but none of the varieties made satisfactory growth. In another first ratoon trial at Edmonton, cut at 14 months, where ratooning was also poor, Q.44 was outstandingly the best cane and out-yielded the other varieties which included Comus, Q.10, Q.13 and H.Q.426.

Eros was better than Q.44 and 32-8560 in a plant trial at Mourilyan which made fair growth and was cut at 13 months.

In two observational trials, both of which grew well, at South Johnstone and Tully, cut at 14½ months and 13 months respectively, Trojan yielded better on both occasions than Eros and Badila. Eros gave the highest yield in a similar plant trial at Mourilyan, cut at 15 months, which also included Trojan and H.Q.426.

Fertilizer Trial.

Only one fertilizer trial was harvested during the year. This was a lime and fertilizer trial on first ratoon Q.44 at Aloomba and was designed to measure growth response on an acid alluvial soil. Lime-plus-fertilizer plots significantly outyielded untreated plots by nine tons of cane per acre, while the application of lime alone was responsible for an increase of two tons per acre.

Fertility Surveys.

The collection of soil samples for fertility surveys was continued for the Brisbane Laboratory.

For the second year in succession soil samples were collected from recently harvested fields of plant cane in the Te Kowai-Walkerston soil survey area at Mackay. These provided further useful data concerning the fertilizer requirements of the soil types sampled. It is interesting to record that results were similar to those obtained from the first year samples which were summarised in the 1945 Annual Report.

Further sampling and analyses in the South Kalkie area confirmed results reported in 1945 that the potash content of the soils is particularly low, and can be raised to a favourable level only by heavy applications of potash fertilizer. Much of the land in this soil survey is irrigated and normal crops cannot be produced under the existing low potash status of the soil.

Soil Erosion Control Experiment.

In conjunction with the Chemist, a soil erosion control experiment was initiated on a hillside at Childers for investigation of the extent of wash on these steeply sloping soils. On a 16 per cent. slope, Nichols terraces were formed on the contour by means of a large road grader and the terrace drains designed to lead off all surplus surface waters into a main grassed drain at the side of the block. Prior to constructing terraces appropriate amounts of lime and fertilizer were applied, both to the experimental area and to an adjacent unterraced area which was to be used as a check comparison. After the contour terraces had been formed the entire area was planted with cane in the late summer of 1946.

Cultivation Practices.

Burning cane before harvesting is a widespread practice which has increased in recent years to the extent that nearly 95 per cent. of the cane is so treated before cutting. In addition the raking and burning of trash before ratooning is also common, and few farmers return any of the crop residues to the land, apart from the tops and stubble incorporated in the soil when the block is ploughed out. Loss of organic matter from the soil inevitably leads to loss of soil structure and a decreased ability to absorb rainfall and irrigation water. Deterioration in soil structure has been noted in many fields, particularly in heavy soils and light textured types. Conservation of trash in ratoons offers scope for investigation and a ratooning implement discussed in a later section of this report offers possibilities in this direction. The spelling of cultivated fields under a temporary grass cover for two or three years, the adoption of measures designed to prevent soil erosion, the regular use of green manure crops, and the judicious application of fertilizer constitute the logical way to restore fertility to depleted soils.

In many areas there is now a big demand for small, fast, high-clearance tractors, and horses have been eliminated on numerous farms. The use of cutter planters is spreading, labour shortages during the war years having stimulated their adoption to a large extent. In some instances poor strikes have been associated with these machines but when used properly strikes appear to be as satisfactory as with methods previously in use. The cutter planter does not perform well in poorly prepared ground and has to be set correctly to place the sett firmly in the soil. Variable cover is still a problem, but modification of the machine may ultimately overcome this. Increasing attention is being paid to double row planters; up to eight acres a day can be handled with these machines and subsequent cultivation with double row cultivation implements on light tractors is greatly facilitated.

In the Mackay area a number of farmers have experimented with modified methods of preparing the seed bed when the soil moisture is low. They have obtained excellent results by substituting either grubbing or disc harrowing, or a combination of both, for final preparation by ploughing.

A practice which received greater attention in northern districts during autumn planting was the compaction of soil in the drills after planting. This was done either by dragging various types of rollers or wooden drags at the rear of the planting machine or by running rubber tyred tractors along the furrows after planting. Under low soil moisture conditions consolidation of soil over the sett definitely improved germination. Variations in the method of compaction are also receiving attention by growers. These include compaction of the furrow bottom, or pressing the sett down before the full soil cover is applied, as contrasted with consolidation after the sett has the full soil cover.

Green Manure Crops.

From Mackay north wilt disease, and to a lesser extent bean fly attack, seriously affected green manure crops, particularly Poona pea, while in most southern districts soil moisture was too low to favour the development of good cover crops.

Gambia pea (*Crotalaria goreensis*) performed very well, particularly in northern districts. In previous years, germination due to low soil moisture at planting or poor seed has been a source of trouble, while deep burial of the seed also results in poor strikes. Seed appears to lose germination ability fairly quickly and old seed is often a failure.

Cusara pea (*Crotalaria usaramoensis*) is equally as good as Gambia pea and tends to give better cover and late growth, but in some instances its volunteer growth has proved more troublesome than the latter.

There is need for a hardier, more disease and pest resistant legume than Poona pea, and a number of strains of various types of legumes are under trial on the Experiment Stations. A cowpea strain selected by the Department of Agriculture (Q.1582) shows promise and will be propagated for further testing.

New Agricultural Implements.

Labour shortages during recent years have stimulated the minds of inventive farmers and attention has been focussed on mechanising as far as practicable, without over capitalising the farms. Cheaper and easier methods of cultivation and weed control are sought, while mechanical harvesting and loading have received considerable attention.

A discussion by Mr. E. R. Behne on mechanical harvesting and loading and their application to Queensland conditions will be published in the October, 1946, issue of the "Cane Growers' Quarterly Bulletin."

During the year several new useful implements and modifications to existing machines or practices were brought to the attention of field officers. These included—

Multi-unit Scarifier.—This is a practice developed by Mr. T. J. Trembath, of Babinda, whereby one man controls several horses, each drawing a modified scarifier. This practice was fully described in an article contributed to the last conference of the Queensland Society of Sugar Cane Technologists, which will be reproduced in an early issue of the "Cane Growers' Quarterly Bulletin."

Scratcher.—This implement was also designed by Mr. Trembath, for the purpose of weeding young plant cane and ratoons in the row, using several horse teams simultaneously. Used in conjunction with the scarifier, this implement has been highly successful in checking weed growth on red volcanic and sandy type soils. As in the case of the scarifier, a full description will be presented in the Quarterly Bulletin.

Cutter Planter: A new type of cutter planter is now in operation on a number of farms. This was designed by Messrs. Harris Bros., Gordonvale. It is adjustable to regulate length of plant and has a consolidating roller attached.

Messrs. P. C. Benn, of El Arish, and R. J. Moyle, of Innisfail, have devised a simple yet satisfactory type of two-drill planter which is claimed to be an improvement on other types. The essential part of this planter is a hollow disc about three feet in diameter and four inches wide, working on a vertical plane on the back axle of a high clearance tractor. One such disc is fitted inside each wheel of the tractor at the required interspace distance. Each disc is divided into sockets, the number of which depends on the spacing desired between setts; the depth of the socket is likewise determined by the length of plant to be used. In operation the discs rotate in the direction of travel and when a stick of cane is placed in a socket it is carried forward to a fixed knife which cuts off a length equal to the depth of the socket. The disc then enters a shield which prevents the cut sett from falling out until it is carried around and dropped into the drill; the remainder of the stalk has meantime been placed by the operator in the next on-coming socket. A frame for carrying plant cane is built on to the tractor.

Supplying Attachment: A modification of the cutter planter introduced by a Pleystowe grower facilitates supplying and large areas can be supplied quickly without seriously disturbing the original rows of young cane. Details of this attachment will be found in the October, 1946, issue of the "Cane Growers' Quarterly Bulletin."

Top Dressing Attachments: In the Mackay area, small tractors for inter-row cultivation are in use on most farms and several types of tractor attachments have been designed for both single and double row application of sulphate of ammonia to young crops. Details of one such attachment will be found in the July, 1946, issue of the "Cane Growers' Quarterly Bulletin."

Ratooning Implement: This implement was designed by Mr. J. C. Emery, of Ayr, and is capable of dealing with heavy trash in ratoons in a very satisfactory manner. It is made as an attachment to a standard grubber frame and consists essentially of a frame carrying two discs for ploughing away from the ratoons and covering trash in the interspace with soil, a horizontal cutting knife for shaving the ratoons, and two stabilising rotary coulters. The angle and position of the discs may be varied over a wide range, while the cutting knife may be raised or lowered as required.

This implement may prove to be very useful in irrigated areas but in its present form it is not entirely suitable for drought or grub affected ratoons.

Isolation Nurseries.

The isolation nursery at Myola (Cairns) has been maintained. The nursery at East Palmerston had to be abandoned, but a new site has been arranged on a farm at Bingil Bay.

Investigations in Progress.

The programme of varietal trials has been enlarged. A variation in the type of trial so as to allow for the planting of two replications of each variety under trial on each of several farms of the same soil type and approximately comparable cultivation practices, has been adopted. All blocks on the same soil type within a district will be grouped and analysed as one experiment. The method has several advantages in that the risk of an entire experiment being vitiated by some local misfortune will be decreased and the agricultural characteristics of trial varieties can be judged under a wider range of conditions.

Numerous minor element trials and lime trials have been set out over a wide area in conjunction with the Chemist, and fertility surveys in selected areas are also being continued.

Cultivation trials on plant and ratoon cane have been initiated and it is hoped to widen these investigations and also embrace trials on seed bed preparation.

A large number of trials have also been set out in co-operation with the Pathologist to investigate chlorotic streak, mosaic infection and germination of plants aided by treatment in mercurial compounds.

REPORT OF THE COMMITTEE ON SEEDLING PROPAGATION.

By C. G. Hughes, Pathologist.

The cross-pollination work was again carried out at Meringa in the shelter of light forest country adjacent to the Northern Sugar Experiment Station. The majority of crosses were made in lanterns although during the peak period a number had to be set up on open stands widely dispersed throughout the forest. All crosses except one were maintained in the usual weak solution of sulphur dioxide and phosphoric acid, the exception, C.O.270 x C.P.29/116, being a field cross.

From the arrowing point of view the season was the poorest on record at Meringa. The spring and early summer of 1945 were extremely dry, and the cane was decidedly backward at the end of the year. Good rains which fell towards the end of December and in January and February resulted in a big improvement in growth, but the wet season ended abruptly during the first week in March. From then on to the end of June there was less than three inches of rain, much of it in amounts so small as to be useless. In addition, a large proportion of the Mulgrave and Hambledon areas where arrows are normally obtained suffered from a severe grub infestation. Under these adverse conditions many varieties, including several of the more important noble canes, did not arrow at all and most of those which did yielded only limited supplies of suitable arrows. As a consequence, many desired combinations could not be made.

In spite of the difficulties 100 crosses and six selfs were completed during the season; these are listed in Table VII. Among the crosses were a number of new combinations which might not have been made normally; however, since it is impossible to predict with certainty the result of any sugar cane cross it will be of interest to see what some of these new combinations produce.

Conditions for the actual crossing were excellent, there being no interference from wet weather, and most varieties kept well in solution and appeared to ripen satisfactorily. However, two crosses were lost completely and individual arrows of several other varieties failed to reach maturity. This was to be expected, as it has been found that the keeping quality of arrows in solution is severely impaired when the cane has been checked by dry weather or grubs.

The majority of arrows were obtained from Freshwater and the Experiment Station, but a special trip was made to Mossman to collect S.J.4 and some P.O.J.2878; both of which varieties carried satisfactorily. All the fuzz obtained was packed in airtight tins and stored in a cold room for use next year.

All Stations germinated fuzz in 1945, using chiefly material from the 1944 crossing which had been held in store. Fuzz was planted in June and July at Bundaberg and Meringa, but at Mackay the sowings were made in early March, 1945, as mentioned in this Report for last year. There has again been an early sowing at Mackay and seedlings are now in the field from the March, 1946, batch.

At Meringa a total of 8,940 seedlings was put out into the field during the period 31st August to 30th October, 1945. Sixty-two families, including several crosses made for the breeding of suitable parents, were represented. In addition to seedlings planted individually in the field, 38 families were included in mass plantings made with narrow strips of surplus seedlings from the crowded germination flats. The original seedlings in the field suffered severely from drought and grubs, so much so that one plant block, which it had not been possible to fumigate, had to be selected in May; the other plant block containing about 30 per cent. of the total seedlings was fumigated and it is expected that it will be saved for selection in the ratoons next year. Selections were made during July, 1946, in the ratoon original seedlings, but again dry weather and attacks by grubs complicated the work.

TABLE VII.—CROSSES EFFECTED DURING THE 1946 CROSS-POLLINATION SEASON.

Females.		Males.
Akbar ..	x	Comus.
Atlas ..	x	C.P.29/116; Comus; Q.33; Q.36; Q.41.
B.298 ..	x	Q.28.
Cato ..	x	C.278; Co.281; Co.290; J.B.1; J.B.3; P.O.J.2878.
Co.270 ..	x	C.P.29/116.
Co.281 ..	x	J.B.6; P.O.J.2878; Q.36.
Co.290 ..	x	D.216; P.O.J.2878.
Co.301 ..	x	P.O.J.2878.
Co.419 ..	x	C.P.29/116.
C.P.29/116 ..	x	Atlas; P.O.J.2878.
D.209 ..	x	E.K.28; H.Q.409; M.1900S.; P.O.J.2878; Q.31; Q.1098.
D.216 ..	x	Co.290.
D.225 ..	x	H.Q.409; J.B.3.
D.285 ..	x	E.282; J.B.1.
D.286 ..	x	F.202.
F.363 ..	x	J.B.6.
J.B.4 ..	x	Co.281; E.281; E.K.28; Eros; F.202; F.363; Q.36.
J.B.6 ..	x	Co.281; F.363.
P.O.J.100 ..	x	C.P.29/116.
P.O.J.2364 ..	x	Comus; M.1900S.
P.O.J.2725 ..	x	C.P. 29/116; C.P.39/778; Co.290; Comus; Eros; G.257; H.Q.409; J.B.13; P.O.J.2878; 31-2484.
P.O.J.2727 ..	x	Q.36.
P.O.J.2875 ..	x	C.P.29/116; Co.290; Comus; E.K.28; G.257; H.Q.409; Q.36.
P.O.J.2878 ..	x	C.P.29/116; Co.281; Co.290; Co.301; 31-2484.
P.O.J.2883 ..	x	C.P.29/116; 31-2484.
Q.33 ..	x	Atlas.
Q.37 ..	x	C.P.29/116; Co.281; Comus; E.K.28; Q.28; Q.33.
Q.41 ..	x	Atlas.
Q.44 ..	x	J.B.3; Q.28; Q.31.
S.J.4 ..	x	C.P.29/116; Co.281; Co.290; Co.301; Comus; Eros; F.363; H.Q.409; J.B.1; Neptune; P.O.J.2878.
Trojan ..	x	Comus; Eros; P.O.J.2878; Q.1098.
31-2484 ..	x	P.O.J.2878.

Selfs were kept of the following varieties:—Co.301; E.281; E.282; E.K.28; F.363; H.Q.409.

At Mackay the 1945 sowing and germination of fuzz needed careful handling in the glasshouse during the height of the summer but results were satisfactory and 7,032 seedlings, representing 30 families, reached the field early winter, 1945. Growth was good during the spring and early summer but the seedlings were showing the effects of dry weather when selected in July, 1946. The 1946 seedlings at Mackay were sown in the late March and some 6,893 plants representing 28 families are now in the field.

At Bundaberg 5,335 seedlings representing 34 families were planted out into the field during November, 1945. The subsequent severe drought combined with the failure of the Station water supply resulted in such poor growth in these seedlings that they had to be ploughed out. The same factors affected the rest of the seedling blocks on the Station and it was decided to cut the losses by ratooning all blocks and postponing all selection until next year.

The plant yield-observation trial at Meringa, which includes the "E" seedlings selected from the 40-sett plots in 1945, became grub-infested but, following fumigation, a very fair crop resulted. Selections will be made on the ratoons next year but in the meantime some of the more promising canes have been planted out for observation in another soil type. At Mackay the plant yield-observation trial will likewise be selected from the ratoons next year.

The "D" series ratoon yield-observation trial at Meringa came away well after harvesting but subsequent growth was rather backward on account of the dry weather. The block was fumigated and little grub damage occurred. Some eight seedlings show promise and they have been planted out for further trial both on the Station and on outside farms. The Mackay ratoon trial of "D" seedlings showed nothing as good as the standard Q.28; the variety Eros had also been included in this trial but it also did not impress against the Q.28.

Owing to a gap in the seedling work at Meringa in 1942 there are no commercial "C" selections in trials at that Station. At Mackay a Latin Square with "C" seedlings was planted in spring, 1945, but due to very poor germination it had to be abandoned.

The ratoon Latin Square trial at Meringa, which included B.232, Q.13, Q.44, P.O.J.2878 and Trojan, has shown the seedling to be inferior to Q.44, especially in its sugar content, and it will be discarded. The "B" canes in the ratoon Latin Square trial at Mackay are not outstanding against Q.28, but one, B.174 (Co.419 x Q.34 (Badila x S.C.12/4)), which in the plant crop was not significantly different from the standard, may be worth further trial. A.224

(now Q.53) is the only "A" cane which has survived all trials at Meringa and may provide a satisfactory substitute for the gumming-susceptible H.Q.426 (Clark's Seedling). Available stocks are being multiplied as rapidly as possible. The Mackay "A" canes have now been reduced to A.130 (P.O.J.2364 Self) and A.147 (Jason x P.O.J.2940); the former is very vigorous but soft buds and very low early sugar are handicaps; A.147 is a shorter, thicker cane. A decision on the fate of these canes will be made when there are more data from commercial plantings.

An interesting Latin Square trial was harvested on the Bundaberg Station in October, 1945. It included the new seedling canes, Q.25, Q.42, Q.49, and Q.52, against an old standard, M.1900 Seedling, which had to be discarded during the gumming epiphytotic some years ago. All canes suffered during the dry autumn and the short growing season was not conducive to a satisfactory trial. However, results showed that Q.42 and Q.52 yielded significantly more sugar per acre than the others. Ratoons have not been satisfactory owing to the drought.

Following are a few brief notes on some of the newer varieties in the Northern, Central, and Southern districts:—

Northern Districts.

Eros.—Has given good results on a wide variety of soils. It is a fairly reliable but slow germinator, tending to sprawl in the early stages. It has ratooned well under low soil moistures and has a comparatively high resistance to grub damage. The late cover is poor, and this combined with a tendency to clinging trash may result in poor burns. It arrows freely and is an early maturer. Susceptibility to downy mildew will necessitate a careful watch over its extension.

Orion and Pindar are two new canes which show promise for early harvesting. Pindar is inclined to be brittle and so susceptible to wind damage.

Q.44 is a good variety for poor, low-lying soils. It strikes well on properly prepared land but it is unreliable in cold dry soil. It ratoons excellently under practically all conditions. Resistance to grub attack is fair and it has stood up well in flooded areas. High winds this year caused some lodging but the sticks did not break. It makes cane early in the season—an excellent characteristic in a dry year. It is susceptible to leaf scald.

S.J.16 is a seeding raised by the Bureau in 1921 but its susceptibility to downy mildew prevented its being cropped in the Burdekin district while that disease was present. It is a thick, vigorous, free-trashing, erect cane and due to its strong rooting system shows good resistance to lodging and a fair resistance to grub attacks. It is susceptible to top-rot and whilst a good ratooner needs good conditions for germination.

Trojan should be planted early on medium to first-class lands and harvested late in the season. It is a thick, strongly rooting variety and suffered comparatively little damage from this year's floods and cyclones. Standing crops have shown a fair resistance to frost but young plant crops in the Burdekin area were considerably affected. It is susceptible to leaf scald.

A seedling raised on the Northern Experiment Station from the cross, Korpi x Q.39 (P.O.J.2878 x Badila), has recently been given a "Q" number, after a series of farm trials. Q.53 is a good germinator and fair ratooner and is otherwise satisfactory from the agricultural viewpoint. It has yielded well with good sugar in preliminary trials and although not a true early maturer usually tests fairly well early in the season. It is susceptible to leaf scald disease and moderately susceptible to grub attack.

Central Districts.

Q.28 is now the major variety in the Mackay district and is also showing promise in South Queensland, where its resistance to Fiji disease is of value. It usually arrows fairly freely and matures in the middle of the season with a medium sugar content. Resistance to most diseases is satisfactory and it has behaved very well during a season of record frosts. It grows rankly on fertile soils, when the long sticks tend to lodge or snap. The trash normally falls away readily but on occasions it clings and causes poor preharvest burns.

Q.45 has proved to be very susceptible to frost, and its hardness and hairiness are also disadvantages. It has had fair success on the better class soils and may be a useful standover type.

Q.50 promises to be a popular variety in the Mackay district. It has shown fair resistance to frost and has withstood drought conditions better than Q.28. Its sugar content is higher than in that variety and with increased supplies of fertilizer available it may replace Q.28 on a number of soil types. In common with many other varieties it has shown some red rot this year.

Southern Districts.

Akbar and Vesta have shown some promise in the Moreton area, although Akbar's susceptibility to chlorotic streak may limit the utility of that variety.

C.P.29/116 has shown itself susceptible to frost attack and, as it has a very low sugar content early in the season, it should not be planted in frosty areas.

Q.42 again showed resistance to frost and in many localities gave a satisfactory return when other varieties, such as Co.290 and C.P.29/116, were refused at the mill on account of low sugar.

Q.47 is a fair striker and ratooner and has shown drought and frost resistance at least equal to Co.290 and P.O.J.2878 on the red volcanic soils.

Q.49 produces a well-barrelled stick and shows promise as a standover cane. It strikes and ratoons well under a wide variety of soils and conditions and although the stool is upright and compact the late cover is good. Resistance to diseases has been satisfactory.

Varietal Statistics.

The varietal composition of the 1945 cane crop for the four main sugar-producing zones and for the State as a whole is set out in Table VIII. Figures given are to the nearest 100 tons and were computed from returns of varieties crushed at individual mills. The variety Badila, owing to its popularity in the wet tropics north of Townsville and the dry, irrigated area about the Burdekin River, is still by far the most important cane in Queensland even though its percentage of the total cane crushed appears to be on the decline. It is of interest to note that the Badila crop in Queensland at over one million tons is one of the largest yields in the world from a purely noble cane. The major South Queensland variety, P.O.J.2878, is in second place to Badila, a position it has occupied since 1939, and the third cane, Co.290, is the same as in the last five years. However, the canes immediately below these on the list show a marked change: In 1944 M.1900S, H.Q.426 and E.K.28, with a total of 22·8 per cent., followed in that order; in 1945 the percentage of these had fallen to 17·4 per cent., and Trojan with 371,600 tons was now in fourth position with Q.28 (292,800 tons) in fifth place. The tonnage of Trojan crushed this year will undoubtedly be greater than in 1945, but the increase will not be as great as in the Mackay cane, Q28. A reduction in tonnage of P.O.J.2878 and Co.290 will occur, due to the drought in South Queensland, and this increase in Q.28 makes it probable that the returns for the present 1946 crushing will show Q.28 in second place to Badila. Cato has increased in both yield and percentage of the crop when compared with 1944, whilst Eros and Comus have doubled. C.P.29/116, which in 1944 was well down the list with only 1,900 tons, last year yielded 51,000 tons to form 5·6 per cent. of the South Queensland crop. Its future is somewhat hard to predict as it lost favour this winter when it was frosted in many areas and had to be cut when the sugar content was very low. Q.44, with nearly 24,000 tons, most of it from one mill area in the North, has increased considerably in tonnage, whilst Q.42, a newcomer to the list in 1944, last year yielded over 17,000 tons; it behaved very well in badly-frosted areas this year, and is assured of a place as a special-purpose cane on that account. S.J.16 has increased in importance on the Burdekin, and Atlas, on the list for the first time, may become one of the established minor varieties in South Queensland. Q.48 is a newcomer to the list but it is very susceptible to red rot and will probably have to be discarded.

The significant changes in the table of the varietal composition of the 1945 crop are reflected in the figures of tonnages yielded by varieties when grouped according to their country of origin. Table IX. shows that Queensland, which in 1944 only just outyielded New Guinea as a source, is now 8 per cent. ahead with 35·1 per cent. of the total crop. Java is still in third place with approximately the same percentage as in 1944. The last five countries occupy the same relative position except that the United States of America has moved up one place and is now ahead of British West Indies.

TABLE VIII.—VARIETAL COMPOSITION OF THE 1945 CANE CROP IN THE FOUR MAIN DISTRICTS AND TH STATE AS A WHOLE. TONNAGES COMPUTED FROM MILL RETURNS AND GIVEN TO NEAREST 100 TONS.

Variety.	North of Townsville.		Giru and Burdekin.		Proserpine and Mackay.		Bundaberg and South.		Whole State.	
	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.
1. Badila	832,700	41·8	351,600	55·1	40,800	4·0	..	..	1,225,000	26·9
2. P.O.J. 2878	70,300	3·5	1,200	0·2	72,200	7·1	444,000	48·9	587,700	12·9
3. Co.290	..	..	..	..	151,700	15·0	276,000	30·4	427,100	9·4
4. Trojan	371,600	18·7	..	..	..	..	..	..	371,600	8·2
5. Q.28	..	..	..	..	292,800	28·9	..	..	292,800	6·4
6. E.K.28	..	..	162,700	25·5	127,300	12·55	..	..	289,900	6·4
7. H.Q.426	196,200	9·85	30,100	4·7	43,100	4·25	..	..	269,400	5·9
8. M.1900 S.	..	..	..	..	233,000	23·0	1,500	0·2	234,500	5·15
9. S.J.4	111,800	5·6	7,000	1·1	..	..	..	..	118,800	2·6
10. Cato	97,500	4·9	..	..	..	..	..	..	97,500	2·1
11. Q.25	..	..	200	..	..	..	74,300	8·2	74,600	1·6
12. S.J.2	12,900	0·65	46,100	7·2	11,100	1·1	..	..	70,000	1·5
13. Pompey	58,800	2·95	..	..	..	..	..	..	58,800	1·3
14. Eros	57,700	2·9	..	..	..	..	..	..	57,700	1·3
15. Comus	27,000	1·35	5,200	0·8	21,400	2·1	..	..	53,600	1·2
16. C.P.29/116	..	..	..	..	..	..	51,000	5·6	51,000	1·1
17. Q.10	39,600	2·0	..	..	..	..	..	..	39,600	0·9
18. H.Q.409	35,900	1·8	..	..	..	..	..	..	35,900	0·8
19. P.O.J.2725	6,000	0·3	300	..	5,100	0·5	17,100	1·9	28,500	0·6
20. Q.44	23,700	1·2	..	..	..	..	..	..	23,700	0·5
21. Q.42	..	..	..	..	..	..	17,300	1·9	17,300	0·4
22. S.J.16	..	..	16,600	2·6	..	..	..	..	16,600	0·4
23. Q.813	3,100	0·2	..	..	7,500	0·7	5,900	0·65	16,500	0·4
24. Q.20	200	..	11,800	1·9	4,100	0·4	..	..	16,100	0·35
25. D.1135	14,800	0·75	..	..	900	0·1	..	..	15,700	0·35
26. P.O.J.213	..	..	..	..	..	..	11,500	1·3	11,500	0·25
27. Juno	10,400	0·5	..	..	..	..	..	..	10,400	0·2
28. Q.2	5,200	0·3	..	..	..	..	..	..	5,200	0·1
29. B.147	5,100	0·3	..	..	..	..	..	..	5,100	0·1
30. Oramboo	1,200	0·1	..	..	900	0·1	2,600	0·3	4,700	0·1
31. Atlas	..	..	..	..	..	..	3,900	0·4	3,900	0·1
32. P.O.J.2714	..	..	1,500	0·2	1,300	0·1	..	..	2,800	·05
33. B.208	..	..	2,600	0·4	..	..	..	..	2,600	·05
34. Brutus	2,600	0·1	..	..	..	..	..	..	2,600	·05
35. Korpi	1,400	0·1	900	0·15	..	..	..	..	2,300	·05
36. Endor	1,500	0·1	..	..	..	..	..	..	1,500	·05
37. Q.48	..	..	..	..	..	..	1,200	0·1	1,200	..
38. H.Q.285	..	..	..	..	500	·05	500	·05	1,000	..
Others	3,900	0·2	..	..	600	·05	1,800	0·2	6,300	0·15
Actual Tons Harvested	1,991,205	..	637,791	..	1,014,420	..	908,566	..	4,551,982	..

TABLE IX.—COMPOSITION OF THE 1945 CROP, ON THE BASIS OF COUNTRY OF ORIGIN OF VARIETIES.

Country of Origin.	Tonnage Harvested.	Per Cent. of Crop.
Queensland	1,598,400	35·1
New Guinea	1,233,750	27·1
Java	920,600	20·2
India	427,750	9·4
Mauritius	234,500	5·15
Fiji	58,800	1·3
United States of America	51,000	1·1
British West Indies	23,400	0·5
Unclassified	3,700	0·1

Report of the Division of Entomology and Pathology.

By R. W. Mungomery, Officer in Charge.

Staff adjustments during the past year necessitated the transfer of the writer to Brisbane whilst there was a loss of one member, Mr. W. D. Gibbons, Cadet Pathologist, who severed his connection with this Department in order to commence studies at the Queensland University in the Faculty of Medicine. Efforts to secure an appointee to fill the position of Assistant Entomologist failed, and because of the scarcity of students likely to graduate in this branch of science during the next year or so, the prospects of increasing the staff to full strength in the immediate future do not appear bright.

On the other hand, the agricultural field officers who were absent with the fighting forces were demobilised, and returned to duty during the year, or were about to do so. They have reassumed responsibility for those duties which, in their absence, had to be undertaken by members of this branch. In addition to this relief, the agricultural officers rendered valuable assistance in the establishment of different entomological and pathological field experiments. Consequently, although the present staff position, in so far as numerical strength is concerned, suffers by comparison with that of previous years, yet the amount of actual investigational work embarked on during the past year showed a marked increase over that carried out during individual war years when staff limitations dictated a policy of pooling resources for the maintenance of the more pressing services within this organisation.

Even had a larger staff been available during the war years, restrictions in the supply of chemicals and equipment would largely have curtailed or hampered investigational work. However, since the cessation of hostilities, new insecticides and fungicides have come to hand from time to time. In some instances supplies are still limited but, in general, sufficient has been made available to satisfy the requirements for experimental work. Notable among these are "Gammexane" and D.D.T.

Although the outstanding topic for comment during the year under review was the severity of the cane grub damage in parts of North Queensland, no less important and spectacular was the high degree of control achieved with "Gammexane" (benzene hexachloride) when used against these pests in small exploratory field trials on the Northern Sugar Experiment Station. This new insecticide is probably the most promising tested since carbon bisulphide first became established as the standard fumigant for use against cane grubs in Queensland. Initial results with "Gammexane" were so encouraging in the limited conditions under which it was tested that a large-scale campaign of experimentation with this product has been put in train for the coming season.

Droughty conditions undoubtedly aggravated the extensive grub damage, but by way of compensation this same unfavourable weather contributed towards an improvement in the disease position, particularly in regard to restricting the spread of some virus diseases. The greatly reduced scale of secondary infection in certain cases, combined with the fact that roguing gangs were able to operate without undue interruptions, may well lead to the elimination of certain diseases in some mill areas, or at least bring this within sight. Unfortunately, however, the persistence of the drought (later coupled with severe frost injury) caused some fields to brown and the tops to die prematurely, and it was then impossible for the roguing gangs to carry out their normal inspections.

Most of the Cane Pest and Disease Control Boards were able to build up their inspecting gangs to pre-war strength, and a continued improvement in the disease position might now be confidently anticipated. Thanks are again extended to those Boards which co-operated in the establishment of varietal trials in their areas, and maintained efficient pest and disease control during the war years in the face of extreme difficulties.

The satisfactory disease position prevailing in the majority of cases was, however, not general throughout all Queensland mill areas, and a field survey disclosed that a marked drift had taken place in the Beenleigh area. There, Fiji disease was found to have increased to such an extent as to threaten some of the newer and more promising varieties. As a consequence, therefore, the necessary legislative machinery was set in motion for the formation of a Cane Pest and Disease Control Board for the Rocky Point Mill area, since it was considered that only by the functioning of such a body could effective control again be established. When this Board eventually comes into being, it will be the seventeenth Cane Pest and Disease Control Board operating under "The Sugar Experiment Stations Acts."

Since conditions within the industry were gradually approaching normal, it was deemed advisable to re-institute the previous policy of holding annual conferences of Cane Pest and Disease Control Boards to discuss pest control matters. Such conferences in the past proved invaluable in promoting greater efficiency in pest control, and they enabled the Boards themselves to be of greater mutual assistance. Unfortunately, there was no opportunity for organising and holding a conference last year, but plans were well advanced for Pest Board delegates to meet in Tully at the end of August, 1946.

The Greyback Cane Beetle (*Dermolepida albohirtum* Water.).

Crop destruction by greyback grubs during 1946 was recorded as the worst for more than twenty years. Damage was particularly serious and widespread in the Mulgrave and Johnstone districts, and it was substantially increased by one of the most unfavourable growing seasons yet experienced. Where early rains fell, beetle flights occurred during October, but they were delayed until late in December in the drier districts of North Queensland. Although in most areas beetles were not observed in unusually large numbers, the damage subsequently caused by grubs indicated that eggs must have been laid under conditions particularly suitable for successful incubation, and that the young grubs must have encountered conditions equally favourable for survival. Because of the protracted dry weather over the spring and summer months, many of the cane crops were definitely backward when the beetles emerged. An early wet season caused a considerable improvement, but the monsoonal rains ceased abruptly in the first week of March. Consequently, most of the cane had made little growth by the time grubs commenced to make serious depredations on the rooting system of the cane stools. The result was that many fields of cane, particularly those in the red soil areas, made little or no further progress after March. Some of these crops which had not produced sufficient cane to warrant harvesting for milling, were practically dead when crushing commenced, and in these instances farmers had no alternative but to burn off these stunted crops and disc or plough them under.

On the other hand, where crops were well advanced before grub damage commenced to be serious, there was not sufficient moisture in the soil to promote new root growth, and in consequence these stools, lacking adequate anchorage, were levered completely out of the ground by the weight and length of the sticks. This also resulted in the complete loss of a large amount of cane. In some areas infestation was so heavy that grub damage extended even to green manure crops and garden shrubs.

In a droughty season such as was experienced during the year under review it was extremely difficult to estimate accurately the actual damage caused by these pests. Nevertheless, the losses attributable to greyback grubs in areas from Tully to Mossman were in the vicinity of 105,000 tons of cane, whilst the infested area amounted to almost 13,000 acres. Fortunately in both the Burdekin and Mackay districts grub damage was neither extensive nor severe. In the latter area the estimated loss was only 300 tons, and £670 was expended in the collection of 12,226 lb. of beetles and grubs.

Attempts to control the pest last season by soil fumigation methods were only partially successful, due in most cases to the work being performed when the soil was in an unfavourable condition. Two cyclones, one in February and the other in March, caused considerable lodging, and prevented mechanically-operated injectors being used in advanced crops. Therefore, the use of these implements was confined to backward crops in those areas which had experienced an early beetle flight. Where a late flight occurred, the wet season terminated before the normal period of fumigation, and consequently fumigation, both manual and mechanical, was restricted because of the rapid desiccation of the soil.

The Blundell mechanical injector performed well on those fields where the above limitations did not operate. In one mill area no less than 100 acres were fumigated with machines, whilst the total area fumigated in this manner amounted to 281 acres. A fair proportion of this was done by hauling two Blundell machines behind one tractor, and with this equipment it was possible to fumigate up to 13 acres over one full daylight period. In all, 1,514 acres were fumigated in the far North, whereas only six acres were fumigated in the Mackay district.

Because of interruptions caused by cyclonic weather, which is a normal expectation during the fumigation campaign, it was realised that earlier control of grubs would be a distinct advantage. Such a plan would involve control of the pest in the younger grub stages and would eliminate the many difficulties experienced when a large proportion of this work must necessarily be carried out after the termination of the wet season. A prerequisite to efficient normal fumigation is the necessity for a large proportion of the grub population to be concentrated near the cane stools, and it is not customary to find the younger grubs so concentrated.

Rather is it more usual for these small grubs to be dispersed irregularly throughout the soil adjacent to the row and in the interspace itself. Thus normal fumigation methods, involving soil treatment in the immediate vicinity of the cane stools, can scarcely be applied to young grubs, since those located in the middle of the interspace would survive.

Accordingly, during the past season consideration was given to fumigating, in the one operation, the middle of the interspace and the two extreme edges. By fumigating along these three parallel lines (or triple line fumigation as it was termed) it was anticipated that the zones of effective fumigation from nearby injection points would meet or overlap, and result in a virtual blanketing of the treated soil with toxic gases.

Experiments involving this triple line system of fumigation were carried out at Meringa, where it was demonstrated that a high degree of grub control could be achieved by this method. In fact, the most successful fumigation work performed on the Northern Sugar Experiment Station last season was conducted along these lines, and it took place at a time when normal methods did not effect a sufficiently high mortality for practical control. Negotiations are now in progress for the construction of a fumigating machine which will carry out this work satisfactorily.

For triple line fumigation machine work offers greater possibilities than normal fumigation since, because the work is carried out at an earlier date when crops are smaller, it follows that it is far easier to drive a horse or tractor through the cane. An added advantage lies in the fact that control work can be completed before grubs are able to inflict any material damage on the cane stools; hence results should be more positive. Further, in order to secure the best results with soil fumigation, it is essential that favourable weather conditions should follow and, obviously, the earlier fumigation is carried out the better is the chance of the fumigated cane benefiting from good growing conditions.

Several new insecticides were received for trial during the past year. Included amongst them were D.D.T. (dichloro-diphenyl-trichlorethane), "Gammexane" (benzene hexachloride), and D.D. Mixture (a mixture of dichloropropylene and dichlorpropane). When applied as sprays to the foliage of certain beetle-feeding trees, both D.D.T. (at a concentration of 0·2 per cent. para para isomer), and "Gammexane" (0·2 per cent. gamma isomer) gave control of beetles similar to that obtained with a lead arsenate spray at a strength of 4 lb. per 100 gallons of water, whilst a D.D.T. spray (1 per cent. para para isomer) produced a more rapid mortality. It was also shown that "Gammexane" as a soil treatment is highly toxic to adults of *D. albohirtum*, and one part of gamma isomer per two million parts of soil was sufficient to cause rapid mortality of these beetles.

However, it was in some small exploratory field trials against cane grubs where "Gammexane" produced outstanding results. In these trials "Gammexane" dust (containing 1·3 per cent. gamma isomer) was applied at rates of 100 lb. and 400 lb. per acre to the soil in the furrows of a plant crop before the field was finally worked level; in the case of a ratoon crop, the applications were made in drills on either side of the cane rows. These treatments were carried out approximately seven weeks before the beetle flight (late December, 1945) in fields where severe grub infestations were anticipated. Both dosages produced 85 per cent. mortality when the grubs were still in the first larval stage, and by the time they had reached the late second stage the kill was practically 100 per cent. in both treatments. By May, 1946, cane in the untreated rows showed the typical yellowing, pinching out, and stunting, which is always associated with heavy grub infestation. In contrast the cane in the "Gammexane" treated rows stood out green and vigorous with no obvious signs of any phytotoxic effects. This was a most striking experiment and it clearly demonstrated the efficacy of "Gammexane" under the conditions of the trial. Other treatments, which included D.D.T. dusts applied similarly, gave very poor control, and D.D.T. seems to offer very little possibilities of economic use.

It was further demonstrated that such applications of "Gammexane" rendered the soil toxic to young grubs for several months. This property of persisting for a lengthy period in the soil at a concentration toxic to insects is a valuable characteristic, particularly insofar that it gives promise of fulfilling a long-felt want for dealing effectively with successive grub infestations which result from beetles emerging over a prolonged flighting period.

With the limited amount of "Gammexane" available for experimentation last season there was no opportunity for testing the value of this material when applied in varying amounts, by different methods, and also at different periods, once infestation had occurred. However, an extensive series of experiments, embracing various soil types, has been planned for the coming season, with the object of determining these points. Several phytotoxicity trials were also established.

Of the many "new" and much publicised insecticides that have been tested from time to time against cane grubs "Gammexane" has given the most encouraging results to date. On that account its efficacy and limitations in cane grub destruction are being investigated over a wide range of conditions in order that a quick and reliable appraisal of its potentialities may be made as early as possible.

Good reports came to hand regarding the resistance of the variety Eros to grub attack in different districts in the far North, but no details were available concerning relative infestations in this and the adjoining varieties that had suffered more severely. Q.44 again showed considerable resistance to light grub infestation, although, as previously noticed, it uproots badly under conditions of heavy infestations.

Lepidiota frenchi Blkb.

Because of the very dry spring-summer period of 1945 in North Queensland, damage from frenchi grubs was, as expected, severe. Large areas on the drier hill slopes were attacked, and in some instances blocks were so badly damaged that growers ploughed the cane in before Christmas, rather than cultivate crops which could not have produced sufficient cane to cover working expenses. The general decrease in soil fertility also served to intensify the damage caused by both frenchi and greyback grubs.

In the Marian-Mirani area of Mackay this pest caused the loss of some ratoon crops, and in other instances infestations were sufficiently heavy to retard growth even under good growing conditions. In the Mackay district it was estimated that frenchi grubs were responsible for tonnage losses at least double those debited against greyback grubs.

Miscellaneous Grub Pests.

Damage more severe than usual was caused by the Melolonthid, *Lepidiota trichosterna* Lea, in different parts of the Bundaberg area, but the majority of the outbreak centres were successfully treated with fumigant. On the red volcanic soils of the Isis, Gin Gin and Bundaberg districts grubs of *Pseudoholophylla furfuracea* Burm. were also responsible for damage, and this was aggravated by the extremely dry conditions that prevailed for the greater part of the growing season.

Beetle Borer (*Rhabdoscelus obscura* Boisd.).

The beetle borer still remained practically under complete control, due chiefly to the practice of pre-harvest burning, which was widely adopted during the war years. The reduced incidence of "top-rot," the growing of lighter crops through inadequate fertilizer supplies, and the increased plantings of varieties more resistant to borer and rat attack, all combined to depress borer damage to almost negligible proportions.

Wireworms (*Lacon variabilis* Cand.).

Infestations by these pests, which are usually more prevalent in the Central districts, were not extensive last spring. However, early this year some plantings were seriously damaged, and further attacks are expected in the spring plantings. Small exploratory trials were set out using "Gammexane" against these pests. Although incomplete, these trials gave promise that satisfactory sett protection may be secured with this chemical when used as a soil insecticide. They also indicated that attention will have to be given to the questions of dosage and placement, so as to prevent the retarding of young root growth on the germinating setts.

Locusts (*Gastrimargus musicus* Fabr.).

During the past season a few swarms of the yellow-winged locust appeared in different parts of the Mackay and Lower Burdekin districts, and odd egg beds are still in existence there. In general, damage to cane was negligible. A number of swarms invaded the Gordonvale area in March, 1946, and eggs were deposited. Subsequently several small bands of young hoppers appeared, and although it was unlikely that they would have caused any serious damage to cane crops, opportunity was taken to test "Gammexane" bran baits against them. These gave a high degree of control except when the baits were distributed at the period of moulting. A "Gammexane" spray (0·2 per cent gamma isomer) was also highly successful in destroying hoppers collected together in masses during the late afternoon. Other bands which moved in later and fed on the grass in the sprayed area also succumbed.

Caterpillars.

Following the March floods, a widespread outbreak of leaf-eating caterpillars occurred along the lowlands bordering the Mulgrave River. Whilst the caterpillars consisted of mixed populations of *Cirphis unipuncta* Haw., *Cirphis loreyi* Dup., and *Mocis trifasciata* Stph., the last named was the only one present in sufficient numbers to cause much damage. This species is a Geometrid caterpillar which is not often found in cane fields in large numbers. Records

indicate that it has occurred in plague proportions approximately every ten years, since the previous outbreaks were reported during 1916, 1925, and 1936. Caterpillars of *M. trifasciata* completely defoliated many acres of cane on the Mulgrave flats, and appearing as they did, at a time when the cane had already experienced a severe check from the floods, they occasioned rather more damage than is usually caused by caterpillars in well advanced crops. A number of dipterous parasites were bred from the caterpillars whilst two ichneumonid wasps were bred from the pupae. These parasites have not yet been identified.

Rats.

In some of the northern mill areas attacks on cane by *Melomys littoralis* Lönn. from September to the end of the crushing period were more severe than usual. However, on the whole, damage by *Rattus conatus* Thomas was of a low order and nowhere did this species assume serious proportions. Field and laboratory equipment was again being assembled, so that further investigational work on both species might be resumed. During the year one technical paper "An Investigation of the Rat Pest Problem in Queensland Cane Felds: 4. Breeding and Life Histories" by W. A. McDougall, was published in "The Queensland Journal of Agricultural Science," Vol. 3 No. 1, March, 1946.

Miscellaneous Pests.

The dry weather was not without its effects on the flora and fauna now established in the immediate vicinity of some of the less compact cane areas. Many animals and birds which normally find sufficient to eat in the natural growth, were forced into the cane fields and did considerable damage in some northern areas. Wallabies and wild pigs were the chief culprits and control measures were seriously handicapped by the shortage of suitable netting. In some instances their depredations were so sustained as to warrant some Boards offering appreciable increases in the amounts of bonuses paid for scalps.

Gumming Disease (*Bacterium vasculorum* (Cobb) Greig-Smith).

The Mossman mill area in the far north of Queensland is the only area in the State where gumming disease is known to occur at the present time in commercial cane crops. There, it was recorded on eleven farms; seven of these are in the Rocky Point area (where the outbreak was first discovered), two are just to the north of these over Saltwater Creek, whilst two others are in the Syndicate area approximately three miles in a direct line from the original centre of infection. A close watch was kept on the situation by the local Cane Pest and Disease Control Board and Bureau officers, while every effort was made to hasten the propagation of resistant or near-resistant varieties. However, considering the methods of spread of the disease and the susceptibility of the bulk of the cane still growing in the district, it is not expected that it will be possible to hold the disease to the present infected area for an indefinite period and the ultimate control of the outbreak must necessarily lie in a change of varieties over a considerable part of the mill area. In order to prevent serious losses within the affected localities and to delay its spread outside as long as possible, a quarantine was proclaimed prior to the 1946 planting season. This proclamation (No. 17 under "The Sugar Experiment Stations Acts, 1900 to 1941") prohibited the planting of the susceptible S.J.4 and Clark's Seedling or H.Q.426, and the removal of any cane from the proclaimed area except for milling. The area quarantined included the cane growing lands of Rocky Point, Bamboo Creek, Miallo and Syndicate, involving 74 farms with a total assigned area of 3,820 acres.

The gumming disease resistance trial at Brisbane run on the same lines as in previous years, included seedlings which had been advanced to the yield-observation or Latin Square trial stage at one or other of the Sugar Experiment Stations. The usual procedure is to plant the new seedlings in approximately six feet of row in the trial and then confirm the results in the following year with a planting at least double that length. Infection rows of H.Q.426 together with the canes under test are artificially inoculated at the start of the season. The former provides a constant source of inoculum and in addition, gives a standard of susceptibility for comparison.

Downy Mildew (*Sclerospora sacchari* T. Miy.).

The only districts in Queensland now showing downy mildew are Mossman and Bundaberg. At Mossman, nine fields on four farms in the Miallo district along Saltwater Creek showed the disease during the period under review. Approximately 50 acres were affected but, except for two fields which had been badly damaged by flood during the 1945 wet season, infections were generally light.

In the Bundaberg district downy mildew was again confined almost entirely to the red volcanic soils of the Woongarra. Some 19 stools were found on three farms at South Kalkie on another soil type, but 4,901 were rogued on the Woongarra—an increase of 3,602 over the 1944-45 period. The efforts of the Cane Pest and Disease Control Board in the Bundaberg area

have allowed the retention of the valuable, although susceptible, P.O.J.2878, and it would appear that in normal years an equilibrium had been reached, between the roguings and the spread of the disease. The conditions during the growing period of the 1946 season were, however, most unusual, and there was a sudden increase in the number of diseased stools. At the beginning of March, following a very dry spring and early summer, a severe hailstorm swept through the Woongarra on a narrow front leaving a trail of shredded leaves and damaged canes. The rain and subsequent hot weather combined to force a tremendous volume of new growth in the damaged fields, side buds shot profusely and poorly grown crops came away from the base of the stool, with the result that conditions were ideal for the spread of downy mildew in the steamy weather. The disease spread considerably in fields in the affected locality but efforts to control it were aided materially by the sudden cessation of the rains in early April and the return to the drought conditions which, with the exception of this brief rainy period, had prevailed since the previous spring.

The downy mildew resistance trial conducted in an isolated area near Buchan's Point in the Cairns district included seedlings from the Northern and Central Experiment Stations, in addition to named canes and a batch of five *robustum* varieties from New Guinea. Conditions for the spread of the disease were excellent during the summer and a good deal of infection showed in the susceptible varieties. However, the drought at the latter part of the growing season combined with some damage from straying and wild stock prevented stalk counts being made on most of the varieties and resistance had to be rated on the basis of infected stools.

Results of stool counts made in July, 1946, were as follows:—

No infection ..	E.122, E.240, E.269, E.283. 28N.G.289. S.J.4.
0-10 per cent. ..	D.104, D.220, E.120, E.121, E.134, E.208, E.209, E.214, E.225, E.245, E.249, E.275, E.276, 28N.G.251, Badila, Q.813, Toledo.
10-25 per cent. ..	E.125, E.127, E.129, E.135, E.230, E.239, E.255, E.280, E.297, 28N.G.218, 28N.G.253, B.208, D.1135.
25-50 per cent. ..	D.285, E.103, E.112, E.113, E.119, E.124, E.131, E.254, B.147, Co.290.
Over 50 per cent. ..	E.105, E.117, E.118, E.126, E.226, E.227, E.247, E.256, E.300, 28N.G.82, Neptune, Q.1098, P.O.J.2878.

The reaction of the *robustum* canes is of wide interest in view of their use as parents in building up new breeding lines in various parts of the world. The 28N.G.289 did not show any disease in 33 stools and 28N.G.251 only one in 32; 28N.G.218 had eight in 40, 28N.G.253 four in 21, and 28N.G.82 was very susceptible with 20 diseased stools in 38.

The resistance trial in the Bundaberg district was on a smaller scale and included only Bundaberg seedlings and standards. A satisfactory amount of disease developed from the infection plantings and some seedlings were shown to be too susceptible for propagation where downy mildew is present.

Results of stalk counts in the middle of June, 1946, were as follows:—

No infection ..	M.1900 Sdg.
0-5 per cent. ..	D.41, D.43, D.44, D.60, D.61, D.62, D.73, Q.28, Q.52.
5-10 per cent. ..	B.50, D.11, D.15, D.46, Co.290.
10-15 per cent. ..	D.9, Q.49.
15-20 per cent. ..	D.14, D.45, P.O.J.2878.
Over 20 per cent. ..	B.56 (63), D.49 (69), D.71 (80), D.75 (76).

It is interesting to note that four of the "D" seedlings in the 0-5 per cent. class, i.e., commercially resistant, are from the cross P.O.J.2878 x Co.290, both of which parent canes show a higher percentage of infection. In general, Queensland experience with the disease reactions of seedlings has shown that the factors for resistance or susceptibility are so heterozygous that combinations of susceptible canes can often be expected to yield a useful proportion of resistant varieties.

Fiji Disease.

In the Bundaberg district some 3,988 stools with Fiji disease were rogued from the 24,657 acres inspected by the Cane Pest and Disease Control Board. At first sight these figures compare favourably with those for 1944-45, when 7,475 diseased stools were found. The improvement, however, is more apparent than real, since this year's figure includes only 231 stools from the quarantined areas at Tantitha and Avondale, leaving 3,757 in the rest of the district; in 1944-45 5,264 stools were found in the quarantined areas, and the rest of the district showed only 2,211 diseased stools. New Fiji infection was found on 24 farms in the Bundaberg area, but most of these farms are in the way of natural spread from known diseased properties, only two being a considerable distance from what would be considered an infection risk.

The Fiji disease position in the Isis area deteriorated somewhat during the year, 49 stools being found on five farms compared with four stools on one farm in the previous year.

In the Maryborough-Bauple district some 84 stools of Fiji disease were found on nine farms. Eighty-one stools (including 27 in a single one-acre block of ratoon Q.25) were found on six farms in the Dundowran-Nikenbah area and one stool each at Tinana, Mungar and Granville. The position was very much the same as for 1944-45, when 72 diseased stools were found. No Fiji disease was found in the Bauple area.

Fiji disease is still a problem in the Moreton area, and practically all parts of the district had some infection, making the selection of disease-free plants virtually impossible. The Cane Pest and Disease Control Board found nearly 11,000 stools during the year, which is approximately the same as for 1944-45. The outlook for satisfactory plants for this coming season is not very bright, as large parts of the district were severely frosted and practically the only suitable cane available is growing in unsafe areas.

A survey of the Rocky Point mill area, which is situated some twenty-five to thirty miles south of Brisbane, and harvests annually about 15,000 tons of cane, showed that Fiji disease was present in threatening amounts in P.O.J. 2878 and, to a lesser extent, in the new C.P.29/116. Fortunately the bulk of the cane in that area consists of the resistant Co.290, but in order to keep the newer varieties on the approved list it will be necessary to take active measures to control the disease. Accordingly, a Cane Pest and Disease Control Board is being constituted for that area and should be in operation to allow of thorough inspections during the main growing period of the next crop. In the meantime, some of the more promising new resistant varieties are being propagated in the area.

The Fiji disease resistance trial planted in the spring of 1944 showed very little disease in the first ratoon crop owing to adverse climatic conditions and it will have to be ratooned again. This trial includes several named varieties as well as Bureau seedlings but there are as yet no indications of the disease reactions. From time to time in these resistance trials results are not available until the second ratoon crop and even under the best conditons the first ratoon crop has to be grown, so there is a minimum delay of nearly two years from the time a cane is planted in a trial until its reaction to Fiji disease is known. With a view to shortening this time lag, an exploratory trial was conducted in a glasshouse in Brisbane. This house is gauzed on one side and well ventilated, but it is proofed against flying insects. In the trial, a representative range of commercial varieties was grown in tubs in the house and inoculated at a suitable stage by infective leaf hoppers (*Perkinsiella saccharicida* Kirk). A satisfactory amount of disease developed and, on the basis of this trial, there appears to be no reason why a trial could not be completed in a suitable glasshouse within a period of six months from the time of planting the setts. There were indications that the numbers of hoppers used would have to be judged carefully, in order to distinguish grades of susceptibility, otherwise infection may be so severe that all varieties except the very highly resistant would become one hundred per cent. diseased.

Further studies were carried out on the transmission of Fiji disease by the leaf hopper (*P. saccharicida*). Results indicate that infective nymphs can transmit the disease in a 20-hour feeding period on healthy cane after removal from diseased plants, and that they can remain infective for at least 16 days after removal from diseased cane. Infective nymphs were also fed on different parts of young healthy plants, and it was found that the disease could be transmitted through the young rolled spindle, mature leaves, and the leaf sheath. The minimum time required for disease symptoms to show after infective hoppers were caged on the plants was 29 days under good growing conditions; when plants were stunted and poorly grown this period was greatly increased and periods up to 236 days were recorded. There was no indication that stunted cane *per se* is more resistant to the disease than vigorously growing cane, but the disease spreads much more rapidly in the latter because of the quicker development of the disease and the much more favourable conditions for feeding and for the multiplication of the leaf hoppers.

Leaf Scald (*Bacterium albilineans* Ashby).

As a general condition leaf scald disease is present in only small amounts in the far northern mill areas, but potentially it is important in that the new varieties, Q.44 and Trojan, are somewhat susceptible to it. There are indications already that these canes will have to be watched in the Babinda, Mulgrave and Innisfail areas on that account. Following the outbreak in Trojan in the Herbert River area a survey was made by the Cane Pest and Disease Control Board and mill officials in the spring and summer of 1945. Approximately 1,100 acres of Trojan in a total of 6,019 examined were found to be infected. Most of the infection occurred on those farms where diseased Trojan had been planted, but 14 farms with 175 acres must be regarded as new infection. Most of the infection was light but approximately 500 tons of cane were estimated as lost because of the disease in 1945 and an estimated loss of 2,000 tons was expected for the 1946 crushing.

A leaf scald resistance trial was planted in spring, 1945, on an isolated farm in the Gordonvale area. It included some 37 seedlings and 11 named canes. Amongst the latter, Eros D.1135 and 32-8560 did not develop any disease, whilst Trojan and Q.44, although susceptible, were not as badly affected as H.Q.426 and Mahona. Drought damage prevented observations on the permanence of symptoms and an estimation of varietal tolerance to the disease.

In the laboratory, it was found that cultures of *Bacterium albilineans* maintained on agar slopes of Wilbrink's peptone-sucrose-salts medium retained their pathogenicity for a period of, at least, 18 months from the original isolations.

Chlorotic Streak.

Chlorotic streak was apparent in the northern mill areas, particularly in low-lying places. It is severe in the Moreton Mill area and during the year was recorded there for the first time in the new canes, Q.28, Q.42, Q.49, Akbar, Solon and Vesta. C.P.29/116 and P.O.J.2878 were also affected. Resistance trials and chlorotic streak diseased material *versus* healthy trials were set out in several districts.

Chlorotic streak was recorded in P.O.J.2878 in the Rocky Point mill area—the first Queensland record of the disease south of Brisbane, although in the northern rivers district of New South Wales, just south of the Queensland border, the disease appears to be well established.

Dwarf Disease.

Inspections in the Mackay district during the year revealed that dwarf disease was present on twenty-one farms. The majority of the affected fields occurred in the Rosella-Te Kowai-Baker's Creek area where dwarf had been found before, but there was a new record of the disease from a group of three farms on Eimeo Road to the north of Mackay. Approximately 115 acres were affected, of which 79 acres were P.O.J.2878; H.Q.426, E.K.28, Q.20, Q.45 and a new Bureau seedling were other canes found to be diseased.

Miscellaneous Diseases.

Red rot was prevalent in all varieties in the Mackay district during the winter of this year owing to the dry weather conditions. It was also present in the drought-stricken Bundaberg areas, but appears to have caused most damage in Co.290 in the Moreton mill area. In the latter district both plant and ratoon crops were affected on all types of soil. Q.28 remained apparently free from the disease and there are hopes that this variety will displace a large part of the susceptible Co.290. Various stem infections, such as red rot and rind disease also occurred in the northern mill areas but they were apparently due to the poor condition of the cane following the dry weather and not to any sudden increase in pathogenicity of causal organisms.

Low temperatures during late autumn and winter resulted in widespread infection with pineapple disease in the newly planted cane in the irrigated Burdekin district. Other factors contributing towards infection were the copious waterings and heavy soil cover which many growers applied in an effort to circumvent the extremely dry conditions then operating. Several plots to test further the effect of the pre-planting treatment of setts with various mercurial preparations were laid down in different parts of the sugar belt.

Cultures of bacteria for the inoculation of legume seeds continued to be supplied to cane farmers and a total of 123 farmers planted 2,690 acres with treated seed; 2,360 acres were sown with various cowpeas, 270 acres with Gambia pea and the remaining 60 acres with lupins, field peas and soybeans.

During the past year, a member of the Bureau's field staff, when serving with the military forces, was stationed in the Gazelle Peninsula in New Britain, and was able to forward four cane varieties collected from native villages. These were planted in the quarantine house. Arrangements were also made to import six or seven C.P. varieties from the United States, and a new seedling from South Africa. Several of the newer Queensland bred varieties were sent, upon request, to the United States Department of Agriculture.

Division of Mill Technology.

By E. R. Behne, Assistant Director and Chief Mill Technologist.

Staff.

Further changes in staff have occurred since the presentation of the previous report. Mr. J. H. Nicklin, an experienced electrical engineer, joined the staff as Technologist (Engineer). Mr. J. E. Tesch was appointed Assistant Mill Technologist. One of the scholarship holders, Mr. C. B. Venton, completed his course in Applied Science at the University and is now attached to the staff as Assistant to Mill Technologist. The other scholarship holder, Mr. L. R. Brain, completed the third year of his course successfully and is now in the final year of his studies.

Mutual Control.

The operation of the Mutual Control scheme was necessarily confined to the compilation of a statement of the overall factory figures for the 1945 season, published in the Synopsis. Twenty-four mills contributed figures, but for one of these the record was incomplete as the result of a serious fire early in the season. Plans have been made to operate the scheme in full for the 1946 season.

Standardisation of Apparatus.

The results of the tests conducted were as follows—

Brix Spindles: A total of 80 spindles were tested. Of these 35 received official certificates and the remaining 45 received unofficial certificates.

Polariscope Tubes: All of the 57 polariscope tubes tested were found satisfactory.

Polariscopes: Three polariscopes were overhauled, one for the Central Sugar Experiment Station, and two on behalf of sugar mills.

pH Meters: Five instruments of a new type were examined, tested, and reported on.

Mill Work.

With the small staff no investigational work could be undertaken at the mills. All mills were visited, and special reports were prepared on several mills at the request of the Companies concerned. Mr. Nicklin concentrated his activities on the possibilities of interconnection between the mill power houses and the regional supply systems, and has acted as a liaison officer between various mills and Regional Electricity Boards.

Conference Papers.

The officers of the Technology Division played an important part in the Conference of the Queensland Society of Sugar Cane Technologists held at Bundaberg in April, 1946. Two papers written by members of the Technology staff were presented as follows—

Mr. J. L. Clayton—"A Note on Recovery Formulae."
Mr. J. H. Nicklin—"Sugar Factory Electrification."

Mill Research Programme Committee.

At the Conference referred to above the opportunity was taken to resume the meetings of the Mill Research Programme Committee. The meeting was held on 9th April, 1946, and the following programme was adopted—

(1) *Maceration Tests.*—This item was considered to be of first importance. The tests will be designed to further those conducted in 1940 and 1941, from which it appeared that the time of contact between the bagasse and the maceration fluid exerted a controlling influence upon the maceration efficiency.

(2) *Molasses Exhaustion Tests.*—It was agreed that the problem of determining to what degree the practical exhaustion of final molasses might be pursued was worthy of extensive investigation. At the same time it was realised that the task was not simple and could not be undertaken completely by the Technology staff at this juncture. It was decided therefore that in 1946 the Bureau should undertake whatever preliminary work could be accommodated in the time available.

(3) *Deterioration of Juice in Storage at High Temperatures.*—The mill representatives offered to co-operate with the Bureau in a research into the effects of temperature and preservatives upon the keeping quality of mixed juice held in storage. At an early date the Bureau will present to the mills a scheme of research in this matter to be undertaken by those mills having the necessary facilities.

News Letter.

The publication of the News Letter was resumed with the issue of No. 11 in the series in January, 1946. One further number was published in June, 1946. This small journal serves as a medium of contact between the Bureau and the technical men of the industry, and the resumption of its publication was greatly appreciated by its readers. Unfortunately, the issues published since January, 1946, have suffered considerable delay in printing, and items of topical interest have had to be avoided. It is expected that this state of affairs will gradually improve.

Overseas Visit of Mr. E. R. Behne.

Between November, 1945, and February, 1946, Mr. E. R. Behne visited U.S.A., Cuba, and Hawaii, accompanying a delegation from the Queensland Cane Growers' Council. His report on manufacturing, and on agricultural subjects with particular reference to the mechanical harvesting and loading of cane, has already been presented. The agricultural section of the report will be published in the Cane Growers' Quarterly Bulletin, and the manufacturing section in News Letter No. 14.

Although this visit was not primarily concerned with matters of technology, and although it was made at an inopportune time for travel, it yielded information of great value to the Technology Division and the industry.

The 1945 Season.

Production Data.—The production data for the 1945 season are set out in Table X. The figures represent totals and weighted averages, and depict the overall performance of the districts and the industry without reference to the work of the individual mills.

The upward trend in the quantity of cane produced, noted in 1944, was maintained, though the quantity harvested in the central district was practically unaltered; unfortunately the quality of the cane was comparatively poor, particularly in the northern and central districts. Despite the poorer quality of the cane in the north the yield of sugar per ton of cane rose above that of 1944, and the figure of 6·892 tons of cane per ton of sugar compares well with previous records. It should be mentioned that this higher yield from cane of poorer quality does not necessarily indicate higher mill efficiency and may result from the distribution of the cane, the more efficient mills treating a higher proportion of the cane than in 1944.

The northern district sugar yield of nearly 282,000 tons approaches the 1941 production, but is still far below pre-war totals. The central and southern districts were not so fortunate. The yield of sugar from the cane decreased and for the first time for many years the central district figures for tons of cane per ton of sugar reached 7. The total production of each of these areas fell below that of 1944, but this must be considered only a slight setback in the trend of rising production. Thanks to the rise in the northern production the State total slightly exceeded that of 1944. The quality of the sugar approximated that of the previous year, which it was noted in the last report was the highest on record.

The shipment of the 1945 season's sugar to refineries has been so slow that at the time of writing—October, 1946—five mills, Tully, Invicta, Pioneer, Kalamia, and Mt. Bauple have not received final returns for the season's production. For these mills the sugar figures quoted are estimated, but are not likely to be changed significantly when the final returns are available. The delays in the shipment of sugar have occasioned great concern to many mills, particularly those shipping through Townsville. This matter is very serious in view of the large storage space required at the mills and wharves, the added expense of double handling, the risk of deterioration of the material during storage, and the delay in receiving final payment for the sugar.

With cane of lower standard than in 1944 the yield of molasses was naturally higher—4·46 gallons per ton of cane compared with 4·23. Over 19 million gallons of molasses were produced with the rather high true purity of 48·09 per cent.* The possibilities of reducing this purity in the future and thereby making substantial gains in sugar recovery are receiving serious consideration at present.

The total consumption of extraneous fuel showed a slight decrease below the 1944 figure but is still high, and will remain so until more uniformity of operation of the mills is made possible by improvements in the cane supply. It is significant that in the northern district much of the molasses which would formerly have been used for fuel was replaced by wood. The decrease of over 2,000 tons in the quantity of molasses burned gives some indication of the demand for this material as a marketable commodity. The northern district remains by far the largest consumer of molasses for fuel, chiefly because the demands for extra fuel have been more acute in that area, and the market value lower than in the south of the State.

Mill Data.—The totals and arithmetic averages of the mill control data for the 1945 season are shown in Table XIII., and in Table XIV. the more important of these figures for the districts and the State are compared with the corresponding figures for 1944. The general conclusions brought out by the production data are verified by the mill data. The northern mills produced more sugar per ton of cane, the central and southern mills less than in 1944. The C.C.S. in cane was lower in all districts.

The 1945 season was notable for low values of mill performance figures. The coefficient of work for the northern area is reasonable and slightly higher than in 1944, but the values of 95·68 and 94·83 for central and southern areas respectively are considerably below normal. These low values are not directly related to the low C.C.S. value of the cane, for the C.C.S. formula was designed to assess the recoverable sucrose in cane of any quality within reasonable limits. The explanation of the low coefficients of work is almost certainly involved with seasonal factors—for instance the mild winter in the central area during which the cane continued to grow without maturing.

Whilst the coefficient of work should not respond to the quality of the cane, other performance figures are directly affected by this factor. The lower recoveries in the central and southern areas are directly attributable to the lower purities of the first expressed and clarified juices. The northern area showed a slightly lower purity of first expressed juice, and a slightly higher recovery, but this is explained by the drop of 0·85 in undetermined loss for the northern mills. The other mills showed rises of 0·88 and 1·19 in undetermined losses which contributed further to the reduction in recoveries of sugar. The extra impurities introduced were reflected in higher molasses losses.

The milling results for the northern district are similar to those of 1944. The crushing rate was a little below that of the previous season, the pol extraction was also reduced, but due to the higher fibre content of the cane, the reduced extractions for the two seasons were almost equal. The central district milling improved. With the crushing rate practically the same as in 1944, the pol extraction rose from 95·23 to 95·33, with a rise of 0·38 in the fibre content of the cane. The reduced extraction therefore rose by 0·24 units. This is partly attributable to a slight rise in the dilution per cent. first expressed juice. In the south the crushing rate rose by nearly four tons of cane per hour and the pol extraction remained unaltered. Once again the fibre content per cent. was higher, and the reduced extraction rose by 0·21 units. The dilution also rose slightly.

With cane of poorer quality than in 1944 all districts yielded more molasses per ton of cane, but the quality of the material did not alter significantly. The exhaustion improved slightly in the north and south, and deteriorated in the central district. The average for the State was almost identical with that of 1944.

It was noted in the production data that the quality of the sugar was again very high, though not the highest recorded. On the basis of arithmetical averages the figures for pol and net titre coincide exactly with those of 1944. Actually the figures for the northern and central districts showed a slight decline, but this was compensated by an improvement in the figures for the southern mills.

As remarked previously the mills used less wood, coal, and molasses for fuel except for a very slight increase in the consumption of molasses in the central district. The figures for the central mills, set out in Table XIII, show a molasses consumption of 0·326 as equivalent bagasse per ton of cane, compared with 0·180 for the previous season. In view of the small change in the total quantity consumed it is apparent that the bulk of the molasses was used in the smaller mills. The figures for total fuel consumption show a rise in all districts, apparently indicative of a decline in boiler performance, though the rises in lost time for the northern and central districts and the rises in dilution for the central and southern districts offer some explanation of the increased fuel consumption.

* Percentage based on 16 million gallons for which returns were received.

TABLE X.—PRODUCTION DATA FOR THE QUEENSLAND SUGAR INDUSTRY FOR THE SEASONS 1939 TO 1945, INCLUSIVE. (TOTALS AND WEIGHTED AVERAGES.)

NORTHERN DISTRICT.*

—	1939.	1940.	1941.	1942.	1943.	1944.	1945.
Cane—							
Tons	2,378,999	2,072,079	2,062,518	1,963,175	1,430,006	1,819,552	1,943,613
Pol per cent.	16·18	16·26	16·27	15·06	16·10	15·69	15·56
Fibre per cent.	9·84	9·89	9·71	9·89	10·62	10·39	10·51
C.C.S.	15·10	15·18	15·21	13·93	14·99	14·64	14·47
Purity first expressed juice	90·30	90·45	90·01	89·00	89·95	90·38	89·75
Sugar—							
Tons (94 n.t.)	351,267	309,437	305,819	263,908	206,634	259,573	281,998
Tons cane per ton sugar	6·77	6·70	6·74	7·44	6·92	7·01	6·89
Pol per cent.	98·45	98·46	98·46	98·59	98·58	98·67	98·59
Net titre	96·88	96·67	96·91	97·20	97·14	97·42	97·26
Dilution indicator	39·91	34·94	34·62	33·81	32·31	28·50	31·44
Mud—							
Tons	42,671	41,814	40,446	34,864	23,045	32,285	31,614
Tons per 100 tons cane	3·11	3·34	3·23	3·01	2·58	2·98	2·93
Pol per cent.	4·01	3·72	3·67	4·32	4·08	4·75	4·57
Molasses—							
Gallons	4,881,846	4,527,762	4,875,551	4,816,269	3,738,134	4,174,420	4,415,061
Gallons per ton cane	3·56	3·62	3·89	4·16	4·19	3·86	4·09
Brix	84·84	84·07	85·40	85·05	84·91	84·71	87·14
Apparent purity	35·81	36·20	35·32	32·85	35·01	35·83	35·32
True purity	47·81	48·88	48·74	47·41	47·73	48·25	47·80
Reducing sugars	16·31	14·30	15·69	17·31	16·35	14·72	16·56
Final bagasse—							
Tons	293,473	269,202	262,501	240,685	197,909	235,132	234,022
Bagasse per cent. cane	21·40	21·52	20·96	20·68	22·01	21·72	21·68
Pol per cent.	3·54	3·31	3·30	2·67	2·83	2·79	2·72
Dry substance per cent.	50·44	50·17	50·51	51·34	51·77	51·45	51·62
Fuel—							
Tons wood	4,972	8,885	8,622	8,433	6,936	6,353	11,143
Tons coal	..	..	..	..	..	..	..
Tons molasses	17,411	9,427	5,970	16,908	12,539	12,144	9,951

* The figures for tons of cane, tons of sugar, and tons of cane per ton of sugar refer to all mills. All others exclude C.S.R. Co. mills.

CENTRAL DISTRICT.*

—	1939.	1940.	1941.	1942.	1943.	1944.	1945.
Cane—							
Tons	2,397,268	1,891,339	1,724,922	1,631,976	1,176,802	1,700,451	1,699,803
Pol per cent.	16·34	16·23	15·98	16·14	16·58	16·87	15·83
Fibre per cent.	11·36	11·37	11·37	11·22	11·95	12·07	12·34
C.C.S.	15·26	15·07	14·92	15·17	15·56	15·81	14·79
Purity first expressed juice	90·44	89·61	90·40	91·40	91·19	90·98	90·48
Sugar—							
Tons (94 n.t.)	371,2o9	280,777	256,923	240,4o8	177,527	262,254	242,673
Tons cane per ton sugar	6·46	6·74	6·71	6·79	6·63	6·48	7·00
Pol per cent.	98·49	98·43	98·71	98·74	98·80	98·91	98·93
Net titre	96·70	96·58	97·20	97·36	97·52	97·77	97·80
Dilution indicator	29·98	31·51	32·83	31·78	29·35	26·95	24·58
Mud—							
Tons	74,851	69,433	60,631	66,194	47,653	66,339	64,449
Tons per 100 tons cane	3·14	3·69	3·52	4·06	4·05	3·91	3·79
Pol per cent.	1·97	2·11	1·80	1·89	1·80	1·85	1·78
Molasses—							
Gallons	9,290,522	7,692,309	6,826,234	6,269,265	4,773,416	7,474,610	7,902,266
Gallons per ton cane	3·88	4·07	3·96	3·84	4·06	4·40	4·65
Brix	88·32	88·53	88·79	86·81	88·15	87·36	87·46
Apparent purity	35·07	35·20	35·21	38·10	37·11	37·36	38·99
True purity	47·58	46·25	46·24	47·00	46·40	47·20	48·71
Reducing sugars	14·15	15·70	15·22	13·02	14·68	14·34	13·54
Final bagasse—							
Tons	599,001	479,723	417,549	418,048	303,907	435,253	437,701
Bagasse per cent. cane	24·99	25·36	24·21	25·62	25·82	25·60	25·75
Pol per cent.	3·03	3·09	2·81	2·76	2·93	2·91	2·67
Dry substance per cent.	49·00	48·78	49·54	49·42	49·42	50·22	51·43
Fuel—							
Tons wood	7,880	8,914	6,270	6,936	10,759	11,422	7,240
Tons coal	373	641	250	171	559	642	514
Tons molasses	5,790	1,642	1,557	1,024	886	1,152	1,299

* The fuel figures exclude Pioneer and Inkerman mills. All others refer to all mills.

TABLE X.—*continued.*

SOUTHERN DISTRICT.*

—	1939.	1940.	1941.	1942.	1943.	1944.	1945.
Cane—							
Tons	1,262,554	1,217,278	1,006,149	755,491	790,616	878,187	908,566
Pol per cent.	14·88	15·42	14·76	14·96	14·42	15·35	14·84
Fibre per cent.	13·70	13·40	12·93	13·85	13·64	13·39	13·97
C.C.S.	13·70	14·12	13·57	13·73	13·26	14·20	13·63
Purity first expressed juice	88·46	87·69	87·94	88·01	88·18	89·15	88·17
Sugar—							
Tons (94 n.t.)	168,896	169,232	134,603	101,314	102,286	121,713	119,918
Tons cane per ton sugar	7·48	7·19	7·48	7·46	7·73	7·22	7·58
Pol per cent.	98·66	98·53	98·80	98·86	98·90	99·08	99·09
Net titre	96·80	96·63	97·16	97·39	97·56	97·92	97·95
Dilution indicator	26·20	30·41	24·27	31·15	29·11	26·13	27·79
Mud—							
Tons	41,390	40,901	31,996	26,669	32,969	31,966	34,716
Tons per 100 tons cane	3·28	3·36	3·18	3·53	4·17	3·64	3·90
Pol per cent.	2·80	2·80	2·90	2·69	2·19	2·50	3·59
Molasses—							
Gallons	5,214,307	5,550,788	4,567,916	3,641,467	3,541,960	3,837,677	4,139,049
Gallons per ton cane	4·13	4·56	4·54	4·82	4·48	4·37	4·56
Brix	90·17	90·75	87·82	89·29	88·82	89·19	88·62
Apparent purity	38·79	37·42	36·77	38·39	39·71	38·72	39·15
True purity	46·22	46·05	45·96	46·32	47·38	46·98	47·20
Reducing sugars	10·34	13·05	12·70	12·06	10·06	11·21	11·08
Final bagasse—							
Tons	351,133	335,558	264,208	215,800	225,235	243,681	267,213
Bagasse per cent. cane	27·86	27·61	26·31	28·56	28·55	27·71	29·41
Pol per cent.	2·32	2·37	2·14	2·22	2·03	2·14	2·17
Dry substance per cent.	52·26	51·64	52·00	51·43	50·51	51·15	50·20
Fuel—							
Tons wood	11,466	10,569	8,573	7,418	15,339	11,044	10,351
Tons coal	50	155	158	504	1,083	602	411
Tons molasses	..	25	..	..	..	..	..

* All figures include all mills except in 1945, when Mud figures exclude Rocky Point and Fuel figures exclude Maryborough.

ALL QUEENSLAND DISTRICTS.*

—	1939.	1940.	1941.	1942.	1943.	1944.	1945.
Cane—							
Tons	6,038,821	5,180,756	4,793,589	4,350,642	3,397,424	4,398,190	4,551,982
Pol per cent.	15·93	16·02	15·75	15·51	15·80	16·15	15·51
Fibre per cent.	11·53	11·51	11·26	11·71	12·02	11·90	12·21
C.C.S.	14·82	14·87	14·64	14·43	14·72	15·07	14·41
Purity first expressed juice	89·90	89·55	89·55	89·80	89·93	90·35	89·70
Sugar—							
Tons (94 n.t.)	891,422	759,446	697,345	605,680	486,447	643,540	644,589
Tons cane per ton sugar	6·77	6·82	6·87	7·18	6·98	6·83	7·06
Pol per cent.	98·52	98·45	98·65	98·71	98·76	98·88	98·86
Net titre	97·00	96·63	97·10	97·31	97·30	97·70	97·67
Dilution indicator	31·89	32·20	31·70	32·16	31·67	27·34	27·75
Mud—							
Tons	158,912	152,148	133,073	127,727	103,667	130,590	130,779
Tons per 100 tons cane	3·16	3·49	3·34	3·60	3·63	3·57	3·56
Pol per cent.	2·78	2·76	2·66	2·72	2·70	2·78	2·93
Molasses—							
Gallons	19,386,675	17,770,859	16,269,701	14,727,001	12,053,510	15,486,707	16,456,376
Gallons per ton cane	3·85	4·08	4·08	4·15	4·22	4·23	4·46
Brix	87·94	88·10	87·50	86·85	87·34	87·10	87·67
Apparent purity	36·26	36·09	35·68	36·45	37·22	37·28	38·05
True purity	47·27	46·86	46·91	46·97	47·10	47·43	48·09
Reducing sugars	13·67	14·52	14·65	14·19	13·84	13·77	13·73
Final bagasse—							
Tons	1,243,607	1,084,483	944,258	874,553	727,051	914,066	938,936
Bagasse per cent. cane	24·72	24·88	23·71	24·67	25·43	24·97	25·46
Pol per cent.	3·03	2·95	2·80	2·62	2·67	2·75	2·54
Dry substance per cent.	50·24	49·98	50·45	50·46	50·57	50·80	51·13
Fuel—							
Tons wood	24,318	28,368	23,465	22,787	33,034	28,819	28,734
Tons coal	423	796	408	741	1,642	1,244	925
Tons molasses	23,201	11,094	7,527	17,932	13,425	13,296	11,250

* Figures for tons of cane, tons of sugar and tons of cane per ton of sugar refer to all mills.
The fuel figures exclude C.S.R. Co., Pioneer, and Inkerman mills. All other figures exclude C.S.R. Co. mills only.
For 1945 Mud figures exclude Rocky Point and Fuel figures exclude Maryborough.

TABLE XI.—SUGAR PRODUCED 1945, COMPARED IN DISTRICTS WITH AGGREGATE PEAK ALLOCATIONS.

District.	Tons 94 n.t. Sugar.			Production Per Cent. Peak.
	Produced.*	Peak.	Excess of Peak Over Production.	
Northern	281,993	330,000	48,007	85·45
Central	242,645	270,000	27,355	89·87
Southern	119,914	137,000	17,086	87·53
Totals	644,552	737,000	92,448	87·46

* Exclusive of local sales (a total of 37 tons).

TABLE XII.—TONS OF CANE PER TON 94 N.T. SUGAR (WEIGHTED AVERAGE).

1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.
6·90	7·31	6·97	6·92	6·94	6·73	6·87	6·77	6·82	6·87	7·18	6·98	6·83	7·06

TABLE XIII.—FIGURES FOR 1945 SEASON. (TOTALS AND ARITHMETIC AVERAGES).

——	Northern.	Central.	Southern.	Totals and Averages.
Tons cane crushed	*1,943,613	*1,699,803	*908,566	*4,551,982
Tons sugar made (94 n.t.)	*281,998	*242,673	*119,918	*644,589
Net titre	97·24	97·72	97·87	97·66
Tons cane per ton 94 n.t. sugar	*6·95	*7·17	*7·88	*7·32
C.C.S. in cane	14·43	14·69	13·70	14·30
Coefficient of work	98·06	95·68	94·83	95·93
Coefficient of work E.S.G.	93·05	90·69	89·94	90·96
Crushing rate	73·95	61·85	46·18	59·32
Lost time, per cent.	10·07	7·58	8·15	8·32
Fibre, per cent. cane	10·55	12·54	14·21	12·66
Pol, per cent. cane	15·53	15·74	14·89	15·41
First expressed juice—				
Brix	20·53	21·10	20·86	20·90
Purity	89·62	90·36	88·37	89·53
Clarified juice—				
Brix	16·12	14·93	15·47	15·37
Purity	89·62	88·73	87·45	88·50
Syrup—				
Brix	69·97	69·74	66·27	68·63
Purity	89·38	88·96	87·60	88·60
Last expressed juice—				
Purity	75·79	76·54	76·46	76·35
Clarified juice per 100 cane	102·55	112·26	104·38	107·48
Dilution per cent. first expressed juice	27·45	42·08	35·37	36·59
Final bagasse—				
Pol	2·72	2·78	2·32	2·61
Dry substance	51·73	51·15	50·80	51·16
Pol extraction	96·15	95·33	95·32	95·51
Reduced extraction	95·34	95·33	95·99	95·56
Lost cane juice per cent. fibre	36·30	36·19	30·31	34·25
Final molasses—				
Gallons per ton cane	4·12	4·83	4·75	4·65
Brix	87·48	87·49	86·94	87·31
Apparent purity	35·44	38·66	40·17	38·45
True purity	47·88	48·34	47·57	47·98
Reducing sugars	16·58	13·47	11·21	13·41
Final mud—				
Tons per 100 tons cane	3·02	3·66	3·79	3·56
Pol	4·75	2·40	4·11	3·49
Sugar—				
Pol	98·588	98·884	99·038	98·870
Reducing sugars	·413	·238	·137	·244
Ash	·188	·186	·207	·193
Moisture	·345	·232	·217	·252
Dilution indicator	32·40	26·24	28·51	28·36
Pol balance—				
Sugar (recovery)	86·79	84·93	82·97	84·69
Bagasse	3·85	4·67	4·68	4·49
Molasses	5·46	6·65	7·24	6·59
Mud	·87	·46	·74	·65
Undetermined	3·03	3·29	4·37	3·58
Boiling house efficiency	94·88	93·04	91·77	93·04
Boiling house efficiency E.S.G.	94·48	92·71	91·50	92·71
Fuel—Calculated as equivalent bagasse per 100 cane—				
†Wood	1·830	1·372	3·565	2·218
†Coal	..	·092	·059	·058
†Molasses	1·552	·326	..	·524
†Total added	3·382	1·790	3·624	2·800
†Bagasse	23·021	28·144	30·550	27·781
†Total	26·403	29·934	34·174	30·581
Crop days	*1,897	*1,731	*1,244	*4,872

* All mills.
† All mills except C.S.R., Pioneer, Inkerman, Maryborough, and Rocky Point. Remainder except C.S.R. and Rocky Point.

TABLE XIV.—AVERAGE PERFORMANCE DATA FOR QUEENSLAND SUGAR FACTORIES, EXCLUSIVE OF THE FOUR FACTORIES OF THE COLONIAL SUGAR REFINING CO., AND EAGLEBY AND ROCKY POINT. (ARITHMETIC AVERAGES.)

	Northern District.		Central District.		Southern District.		All Queensland Districts.	
	1944.	1945.	1944.	1945.	1944.	1945.	1944.	1945.
Pol in cane	15·81	15·53	16·90	15·74	15·17	14·89	16·08	15·41
Fibre in cane	10·42	10·55	12·16	12·54	13·60	14·21	12·25	12·66
Purity—								
First expressed juice	90·28	89·62	90·94	90·36	89·29	88·37	90·24	89·53
*Clarified juice	90·19	89·62	89·73	88·73	88·30	87·45	89·34	88·50
*Syrup	90·03	89·38	89·82	88·96	88·17	87·60	89·28	88·60
Gallons molasses per ton cane	3·90	4·12	4·45	4·83	4·49	4·75	4·34	4·65
Apparent purity final molasses	36·03	35·44	37·51	38·66	39·96	40·17	38·00	38·45
Overall recovery	86·59	86·79	86·85	84·93	84·82	82·97	86·11	84·69
Overall recovery E.S.G.	86·22	86·41	86·55	84·62	84·55	82·73	85·81	84·39
Recovery on mixed juice	89·94	90·26	91·10	89·07	89·11	87·04	90·18	88·66
Recovery on mixed juice E.S.G.	89·55	89·87	90·79	88·75	88·83	86·78	89·86	88·34
Boiling house efficiency	93·90	94·88	94·76	93·04	93·66	91·77	94·20	93·04
Boiling house efficiency E.S.G.	93·50	94·48	94·52	92·71	93·36	91·50	93·91	92·71
Pol extraction	96·22	96·15	95·23	95·33	95·32	95·32	95·48	95·51
Reduced extraction	95·35	95·34	95·09	95·33	95·78	95·99	95·38	95·56
C.C.S. in cane	14·62	14·43	15·85	14·69	14·04	13·70	14·98	14·30
Coefficient of work	97·43	98·06	97·17	95·68	96·52	94·83	97·01	95·93
Coefficient of work E.S.G.	92·40	93·05	92·10	90·69	91·60	89·94	92·00	90·96

* 1944 Figures exclude Pioneer and Inkerman Mills.

TABLE XV.—CANE MILLED AND SUGAR YIELD, SEASON 1945.

	Tons Cane Crushed.	Tons 94 n.t. Sugar Made.	Tons Cane per Ton 94 n.t. Sugar.	
			1945.	1944.
Mossman	118,752	17,012	6·980	7·022
Hambledon	149,876	22,212	6·748	6·834
Mulgrave	221,020	31,275	7·067	7·309
Babinda	179,845	24,598	7·311	7·144
Goondi	158,173	21,974	7·198	7·333
South Johnstone	213,861	30,500	7·012	6·897
Mourilyan	137,836	19,037	7·240	6·972
Tully	207,891	*30,409	6·836	6·808
Macknade	271,513	41,911	6·481	6·918
Victoria	284,846	43,065	6·614	6·945
Sugar—Local Sales	..	5	..	..
Total for Northern District	1,943,613	281,998	6·892	7·010
Invicta	93,170	*14,717	6·331	6·306
Pioneer	178,892	*28,424	6·294	6·161
Kalamia	201,715	*31,826	6·338	6·418
Inkerman	211,606	32,627	6·486	6·537
Proserpine	147,982	22,035	6·716	6·386
Farleigh	172,468	21,969	7·851	6·748
Racecourse	120,105	14,768	8·133	6·574
Pleystowe	152,654	20,165	7·570	6·428
Marian	147,128	20,231	7·272	6·288
Cattle Creek	80,412	11,290	7·122	6·631
North Eton	64,305	7,774	8·272	6·902
Plane Creek	129,366	16,819	7·692	6·608
Sugar—Local Sales	..	28	..	..
Total for Central District	1,699,803	242,673	7·004	6·484
Bingera	177,952	23,948	7·431	6·966
Fairymead	156,987	20,314	7·728	7·356
Millaquin	137,397	17,686	7·769	7·015
Qunaba	52,956	6,350	8·340	7·405
Gin Gin	40,153	5,385	7·456	7·480
Isis	162,328	23,191	7·000	6·851
Maryborough	30,454	3,402	8·952	8·064
Mount Bauple	35,522	*4,777	7·436	7·804
Moreton	96,391	12,855	7·498	7·626
Rocky Point	18,426	2,006	9·185	9·031
Sugar—Local Sales	..	4	..	..
Total for Southern District	908,566	119,918	7·577	7·215
Total for All Districts	4,551,982	644,589	7·062	6·834

* Figures tentative. Final returns not available.

TABLE XVI.—ADJUSTED TONNAGES OF SUGAR DEEMED TO BE MANUFACTURED FROM MILL'S OWN CANE.

Mossman	17,012	Kalamia	31,826	Millaquin	17,686
Hambledon	22,212	Inkerman	32,627	Qunaba	6,350
Mulgrave	31,275	Proserpine	22,035	Gin Gin	5,385
Babinda	24,598	Farleigh	21,793	Isis	21,449
Goondi	21,974	Racecourse	14,886	Maryborough	7,184
South Johnstone	30,500	Pleystowe	20,170	Mt. Bauple	4,690
Mourilyan	19,037	Marian	20,257	Moreton	12,855
Tully	30,409	Cattle Creek	11,283	Eagleby	40
Macknade	41,911	North Eton	7,796	Rocky Point	1,966
Victoria	43,065	Plane Creek	16,831	Local sales	37
Invicta	14,717	Bingera	23,948		
Pioneer	28,424	Fairymead	18,361	Total	644,589

TABLE XVII.—AVERAGE CRUSHING RATES. (TONS CANE PER HOUR.) (ARITHMETIC AVERAGE.)

1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.
60·80	61·53	61·67	63·32	55·93	55·45	57·33	59·32

TOTAL CROP DAYS.

——	1937.	1938.	1939.	1940.	1941.	1942.	1943.	1944.	1945.
Crop days	4,497	4,822	5,163	4,558	4,034	4,432	4,270	4,749	4,872

TABLE XVIII.—ANALYSIS OF GROSS TOTAL TIME FOR 1945 SEASON.

——	——	Total Hours.	Per Cent. of Gross Total Hours.	Per Cent. of Available Crushing Hours.
Available for Crushing	Crushing	55,235·61	64·08	91·19
	Lost Time—			
	Manufacture	1,923·44	2·23	3·17
	Cane Supply	3,413·67	3·96	5·64
	Total	60,572·72	70·27	100·00
Unavailable for Crushing	Premeditated Stops and Week-ends	25,624·22	29·73	..
	Gross Total	86,196·94	100·00	..

TABLE XIX.—FUEL CALCULATED AS EQUIVALENT BAGASSE* PER 100 CANE. (ARITHMETIC AVERAGES.)

Year.	Wood.	Coal, &c.	Molasses.	Total Added.	Bagasse.	Total.
NORTHERN DISTRICT.						
1938	·368	..	1·664	2·032	23·155	25·187
1939	·557	..	1·807	2·364	21·892	24·256
1940	1·226	..	1·217	2·443	21·982	24·425
1941	1·230	..	·768	1·998	21·390	23·388
1942	1·243	..	2·276	3·519	21·637	25·156
1943	1·410	..	2·224	3·634	23·182	26·816
1944	1·063	..	1·770	2·833	22·633	25·466
1945	1·830	..	1·552	3·382	23·021	26·403
CENTRAL DISTRICT.						
1938	1·504	·329	·542	2·375	25·317	27·692
1939	·993	·058	·646	1·697	24·743	26·440
1940	1·138	·019	·220	1·377	24·801	26·178
1941	1·106	·047	·295	1·448	24·837	26·285
1942	1·224	·046	·217	1·487	26·254	27·741
1943	2·589	·189	·198	2·976	26·163	29·139
1944	1·995	·131	·180	2·306	27·061	29·367
1945	1·372	·092	·326	1·790	28·144	29·934
SOUTHERN DISTRICT.						
1938	4·586	·017	·012	4·615	29·855	34·470
1939	2·714	·010	..	2·724	30·011	32·735
1940	2·535	·031	·005	2·571	29·341	31·912
1941	2·659	·045	..	2·704	28·612	31·316
1942	3·197	·183	..	3·380	30·325	33·705
1943	5·385	·380	..	5·765	29·358	35·123
1944	4·306	·151	..	4·457	29·326	33·783
1945	3·565	·059	..	3·624	30·550	34·174
ALL QUEENSLAND DISTRICTS.						
1938	2·341	·137	·621	3·099	26·432	29·531
1939	1·508	·027	·692	2·227	25·956	28·183
1940	1·662	·018	·382	2·062	25·759	27·821
1941	1·695	·035	·302	2·032	25·369	27·401
1942	1·939	·084	·633	2·656	26·612	29·268
1943	3·313	·212	·613	4·138	26·598	30·736
1944	2·603	·107	·497	3·207	26·814	30·021
1945	2·218	·058	·524	2·800	27·781	30·581

* Equivalent bagasse = bagasse with net calorific value of 3,300 B.Th.U. per lb.

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